KNOWLEDGE
AN
ILLUSTRATED MAGAZINE
OF
SCIENCE, LITERATURE, & ART

LONDON: OCTOBER 1, 1886.

THE UNKNOWABLE.

By Richard A. Proctor.

A DIGRESSION CONCERNING THE BUDDHA.

A CORRESPONDENT pleasantly points out what he considers an error in my remarks upon Buddhism in the August number. He says that the Buddha is not held to be a virgin-born saviour, but was "the son of King Suddhodana and Queen Maia, who reigned over the Sakyas. The white elephant which Maia in a dream saw enter her side is understood to be the symbol of the Arahat, that is, of 'one having the perfect wisdom.' So many Buddhist stories," proceeds my correspondent, "have merely a symbolical meaning that it is difficult for an outsider to find the real esoteric doctrine." Regarding me manifestly as very much outside, he directs my attention to the Buddhist Catechism compiled by my entertaining but by no means erudite friend, Colonel Hy. Olcott, president of the Theosophical Society, and to Mr. A. P. Sinnett's "Esoteric Buddhism," by which, he thinks, the Buddhist doctrines will be properly presented to me.

While grateful to my correspondent for his evidently kind intention, I must explain that I should deem it a very serious offence against the readers of Knowledge if I had undertaken to introduce any remarks about so important a subject as Buddhism, the religion of more than one-third of the human race, when so ill-informed that Colonel Olcott's feeble compilation or Mr. Sinnett's borrowed mysticism could be of the least use to me. Colonel Olcott may tell his theosophist followers that Buddha, as he insists on calling Gautama, had "that many disciples," and that Buddhists offer flowers to the statue of Buddha, "but not with the sentiment of the idolator," and otherwise ungrammatically or inexactly catechise them; but every page of his Catechism shows how little he has really studied his subject. Mr. Sinnett is more careful, yet my correspondent will find it well to turn from his pages to some such thoroughly trustworthy work as "Buddhism," by Mr. Rhys Davids.

It is quite true, however, that a religion so widespread as Buddhism, and one which can be adapted (without artifice) to minds of so many varying orders, deserves to be carefully guarded against erroneous ideas. My own belief that Christian doctrines were derived from the East, and are altogether Aryan in origin (their apparent Semitic source being comparable to the apparent origin of a river in a lake which has derived every drop of its waters from snow-clad heights around it), makes me the more careful to explain in what sense I spoke of the Buddha, in the August number, as "a virgin-born saviour." I did, indeed, carefully explain at the time that there was no legend of virgin birth till long after Gautama's death, when his history underwent the usual modification, by which features of the undying solar legend were worked into it. But I will now deal with the point more particularly.

In considering this matter we shall not really be losing ground. For in the first place we have in the history of Gautama the most striking illustration of the adaptation of the solar ideas to the history of a truly great teacher who passed a real though by no means an ordinary life upon earth; and, in the second place, a religion which stands absolutely first in the number of its followers, and can claim very favourable comparison with all other religions alike for the intelligence and character of the races holding it, and for the inherent beauty of its doctrines, deserves full consideration in an essay seeking, as this does, to sketch the search men have made after the unknowable and infinite mystery lying at the back of physical, mental, and moral phenomena.*

The original versions of the story of Gautama were doubtless free from the miraculous and impossible details which appear later. Yet quite early he was regarded as having been absolutely sinless and perfectly wise. Later this developed into the belief that he could not have been born as other men are. For the doctrine that all men born in the ordinary way must of necessity be imperfect is Aryan in origin. (It probably reached Paul of Tarsus, directly or indirectly, from the East; indeed it seems almost impossible to explain the essentially Buddhist doctrines of Semitic religious teachers in the first century of the Christian era in any other way than as derived, with such modifications as were inevitable in such a transfer, from Buddhist sources.) Hence quite naturally arose the teaching that, as Mr. Rhys Davids puts it, "Gautama had no earthly father." "He descended" (according to this later account of him) "of his own accord into his mother's womb from his throne in heaven." "He gave," further, "unmistakable signs, immediately after his birth, of his high character and of his future greatness. Earth and heaven at his birth united to pay him homage; the very trees bent of their own accord over his mother, and the very angels and archangels were present with their help. His mother was the best and purest of the daughters of men,† and his father was of royal lineage, and a prince of wealth and power. It was a pious task to make his abnegation and his condescension greater

* The seeming delay of a month in the appearance of this digressive matter will be explained by certain remarks in "Notes on Americanisms." I do not know that it matters much. The considerations bearing on the religions of the world, and on the search after adequate reasons for ceasing to look for an interpretation of the mystery of the universe, are too numerous to be even touched on in very limited space. I try to give in each contribution matter for independent study.

† I have not found any traces of such further development of the ideas here indicated, as we find in the Catholic doctrine that Mary, the virgin mother of Christ, was born free from the stain of original sin. In Inman's "Ancient Faiths" the doctrine of the Immaculate Conception of Mary is confounded with the doctrine of the Collyridians, that Mary was born of a virgin. The Catholic Church has not taught that. In fact, the danger of such a doctrine (with the manifest sorites which must presently be associated with it—since if there is no difference in this respect between Jesus and Mary, neither should there be between Mary and Anne, or between Anne and *her* mother, and so on indefinitely) would prevent its being ever adopted by adepts in theology. The doctrine of the Immaculate Conception involves no such risk. It teaches only that by divine intervention the stain of Adam's sin, which in all other cases, it appears, marks every child of Adam from the moment of his or her conception, was not suffered to fall on Mary. So far from being a difficult doctrine of Catholicity, this one, viewing the matter entirely from the outside, seems singularly easy to believe: the real difficulty lying not so much in the doctrine that this little Jewess was free from Adam's primeval offence, as in believing that every one else, Jew or Gentile, must be stained by it.

XUM

by the comparison between the splendour of the position he was to abandon and the poverty in which he afterwards lived; and in countries distant from Kapilavastu the inconsistencies between such glowing accounts and the very names they contain passed unnoticed by credulous hearers,"*—as has happened since.

Hardy mentions in his "Manual of Buddhism," p. 141, the doctrine of the perpetual virginity of Maya. On this point Mr. Rhys Davids remarks, dealing always, however, with ideas which he regards as purely legendary, "As a dāgaba holding sacred relics cannot be used to guard any less sacred object, so 'the Buddha's' mother can bear no other child, and on the seventh day after his birth she dies." There is no historical authority, it need hardly be said, for Maya's death in this manner, any more than there is for her perpetual virginity. But it corresponds well with the solar ideas which had existed for ages before Gautama's time, and were bound in due course to gather around his story when he had been dead long enough for the real facts to be forgotten. For, soon after the birth of the sun-god of the year, the constellation of the Virgin, which had been on the horizon visibly at dawn, was lost in his light. Whether we consider the daily or yearly apparent motion of the sun, the constellation would disappear soon after the appearance of the sun-god—in one case as his light invaded the heavens, in the other as his progress carried him forwards from the constellation, so that when dawn approached the constellation had already set. The interpretation may be varied (but is by no means necessarily done away with) if other natural symbolisms are recognised for Maya. She may represent, as M. Senart suggests, the sovereign creative power, or, as the same writer thinks possible, she may be the half-obscure goddess of the vapours of the morning, dying away from the first hour in the dazzling radiance of her sun. "In reality," he remarks, "she survives under the name of the Creatress, the nurse of the universe," just as Isis survived, and as Mary survives according to Catholic ritual, as Lux perpetua, Turris eburnea, Stella Maris, and, above all, as Regina Cœli —"Queen of Heaven."

Before leaving this point, I may note that as there is abundant authority for one part of the description, "virgin-born saviour," so is there for the other. I cannot do better than quote here the opinion of M. l'Abbé Huc, the well-known French missionary in the East. In speaking of the Buddha he says, "In the eyes of Buddhists this personage is sometimes a man, at others a god. Or, rather, he is both one and the other—a divine incarnation, a man-god, who came into the world to enlighten men, to redeem them, and to point out to them the path of salvation. . . . This idea of redemption by a divine incarnation," adds M. Huc, "is so general and popular among the Buddhists that, during our travels in Upper Asia, we everywhere found it expressed in a neat formula. If we addressed to a Mongol or a Thibetan the question, 'Who is the Buddha?' he would immediately reply, 'The Saviour of Men'" ("Huc's Travels," vol. i., pp. 326, 327). This must have rather startled a Catholic missionary.

MYTHS OF THE SUN-GOD'S BIRTH.

We have now to show that the ancient sun-myths agreed in presenting the three following features:—First, the sun-god was announced by a star; secondly, he was born in a cave; and thirdly, sacrificial offerings were presented to him.

Taking a few of the undoubted representatives of the sun-god, we find Osiris (virgin-born) was announced by a star in the east on December 25, or three days after the winter solstice. He was exposed in effigy to the adoration of the people in the form of a babe lying in a manger (see the "Chronicles of Alexandria," an ancient Christian work*), offerings of precious articles and perfumes being made by the people through the priests or wise men.

Horus, the other Egyptian sun-god, also virgin-born, was in like manner worshipped at Christmas time, his image as a babe being placed in a specially sacred inmost recess of the temple known as the birthplace of Horus. The people passed through the holy adytum to worship before this sacred recess; but at Christmas time the image was brought out of the sanctuary with special ceremonies.

Mithras, the Persian sun-god, whose arrival was announced by a group of stars, was born in a cave or grotto at early dawn. He was visited by Magi, and presented with gifts of gold, frankincense, and myrrh.

Adonis, or Thammuz, was placed in a cave shortly after birth.

Of Apollo and Bacchus, both sun-gods, we have the same account.

Crishna, whose birth had been announced by a special star, was born in a cave and cradled among herdsmen. After his birth the Indian prophet Nared, having heard of his fame, visited his mother and reputed father at Gakool, examined the stars, and declared him to be of divine descent. Crishna received the adoration of the shepherds as a heaven-born child, and was presented with gifts of sandal-wood and perfumes.

The birth of the Buddha (Gautama) was announced in the heavens by an asterism which was seen rising above the eastern horizon. Bunsen tells us it was called the Messianic star, a term no doubt corresponding with the name given by astronomers to the star whose heliacal rising announced the birth of the sun of the new year. He was visited at his birth by a prophet Asita, and by wise men, who hailed him as the God of Gods at dawn. "Asita wept at the thought that he himself was too old to see the day when the law of salvation would be taught by the infant whom he had come to contemplate."† The Buddha's virgin mother, Maia, was on a journey at the time of his birth, and according to one account he was born under a tree, while another assigns an inn as his birthplace. This variety, by the way, characterises many of the stories of the birth of solar gods and heroes; for while Apollo, according to one story, was born in a cave at dawn, according to another he was born under a tree, his mother being on a journey. The same story is told of the birth of Lao-tsze, the Chinese virgin-born Teacher. It may further be remarked that though the Gospel according to Matthew speaks of the birthplace of Christ as a house or inn; while that according to Luke speaks of it as a stable (and alone repeats the story of the taxing, which is taken

* Rhys Davids' "Buddhism," pp. 182, 183.

* Pigord says:—"Deinceps Egyptii parituram Virginem magno in honore habuerunt; quin soliti sunt puerum effingere jacentem in præsepe, quali postea in Bethlehemeticâ spelunca natus est."

† Jataka, 54. I have quoted from Viscount Amberley's analysis, but would refer the reader to Mr. Rhys Davids' "Buddhism," p. 185. Of course it must be understood that these details gathered only in long later ages around the record of Gautama. As in all other cases in which historic persons have come to be associated with ideas belonging to solar myths, there is not a particle of real evidence in Gautama's case in favour of any events of a supernatural character having attended the conception and birth of the future teacher, or having marked any part of his career even until his death. We have not quite such decisive evidence in his case as we have in later stories (specially in the record of Mahomet) to show that no miraculous events actually marked the career of the teacher. But inasmuch as we have no evidence whatever that such events occurred (for old tales, composed long after all contemporaries had passed away, assuredly do not count as evidence), and as only overwhelming evidence could convince reasoning men that such events were supposed by contemporaries to have happened, we may quite safely dismiss all such stories to their appropriate limbo.

almost bodily from the record of Crishna), the Protevangelion, or First Gospel, attributed to James, the brother of Jesus (before the doctrine of Mary's perpetual virginity had arisen), gives a very full account of the birth of the child in a cave, to which Joseph had been obliged to take Mary, who had been seized with labour pains while on a journey, and to his account the Catholic Church seems still to incline, as any one may learn who will be at the pains to visit a Catholic cathedral at Christmas time.

THE STORY OF CREATION.

A PLAIN ACCOUNT OF EVOLUTION.

By Edward Clodd.

XI.—PRESENT LIFE-FORMS.

B. *Animals* (concluded).—VI. Vertebrata.

WE now reach the last and highest of the divisions of animal life—the sub-kingdom of the *back-boned*, which includes Man—and when we note the differences between its representative types and those of the divisions below it, all of which include *boneless* animals, we feel that, if there be any break in the continuity of life, it should be found between invertebrates and vertebrates.

Speaking broadly, since the lowest living things have no unlikeness in parts, invertebrates may be said to consist of a single tube or cavity containing the nervous and vascular systems in common, and to have an *outside* skeleton, which is simply a hardening of the skin. In contrast to this, vertebrates consist of two tubes or cavities, the smaller of which encloses the central parts of the nervous system (*i.e.*, the brain and spinal cord), and the other the vascular system (*i.e.*, the organs of digestion and circulation), and they have an *inside* skeleton, the most important part of which is the spine or backbone, which separates the two tubes, and is made up of a number of jointed bones or vertebræ united by remains of the cartilaginous notochord, thus giving flexible action to the whole column. The advantage of this combined strength and ease of movement is seen in fishes as they dart through the water, in the gliding of the snake, the leap of the antelope, and the spring of the lion; while, as compared with animals which are either naked or covered by a rigid horny skeleton, cumbersome as the armour of our ancestors, vertebrates have an enormous superiority in their internal framework of living bone, which adapts itself to, as well as nourishes and protects, the softer parts. Vertebrates are composed of segments placed one behind the other, as in the Annulosa; but the lines of junction have been more or less effaced by structural modification, as, *e.g.*, in the formation of the skull, which is composed of nine or more coalesced segments. The threefold division of the body into head, chest, and belly, so characteristic of shellfish and insects, is, however, more obvious. Wherever limbs are present they never exceed four in number, and are in pairs, whether as fins of fish (not reckoning the unpaired fins as limbs), wings and legs of birds and bats, fore and hind legs of quadrupeds, or arms and legs of man; all being modifications of one type—as, for example, in the framework of the bat's wing, the bones forming which, although immensely prolonged, correspond to our fingers.

Such, in crude outline, are the principal features of the highest animals, but no general description can cover the infinite variety of vertebral forms. Some, as the lancelet and shark, have no bony spine; the frog has no ribs; the tortoise is encased in a shield composed of the hardened skin of its back and belly; and even in the marked division of vertebrates into cold-blooded, embracing fish and reptiles, and warm-blooded, embracing birds and mammals, exceptions occur in warm-blooded fish, as the tunny and the bonito. But no differences in detail can obscure the fact that vertebrates are all modifications of a common type, the variations in structure being due to differences of function determined by unlike modes of life. Obviously the highest types are those in which each organ has only one thing to do, since where one organ has many things to do each is done less completely. Moreover, details obscure relations, and since it is with the relation of all life-forms that we are chiefly concerned, we may pass to further evidence of connexion between the highest invertebrate and the lowest animal of vertebrate character. In water, the population of which far outnumbers that of the land, and the elements of which make up the larger proportion of every plant and animal, life had its beginnings; and it is in water that we find this connecting link in the shape of a semi-transparent creature not more than two inches in length, known as the *lancelet*, from its lance-like shape, and also as *Amphioxus* (Gr. *amphi*, both, and *oxus*, sharp), because both ends are nearly alike. The mouth of this headless, feeble-eyed animal has cilia for driving in the food-carrying water, and opens into a wide gullet through the breathing slits, in which the water, after giving up its oxygen to the colourless blood, passes into the body-cavity, and is expelled at the vent. There being no muscular heart, the blood is circulated by contractions of the vessels.

Now this boneless creature is classed among back-boned animals because it has the primitive gristly rod, called the notochord, from which the spine is developed in all true vertebrates. Above this rod lies the nervous system, composed of a single cord, which bulges slightly as a primitive brain near the mouth. In describing the *sea-squirt*, or *ascidian*, reference was made to its short notochord and single nerve-ganglion, which correspond, as far as they go, to like organs in the lancelet; and if they were lengthened so as to run along the whole of the back of the ascidian, the positions in the two animals would be found to agree exactly. This certainly points to their common descent, and when we compare the embryos and mode of development of both, the evidence will be found complete.

Fishes, as the least specialised vertebrates, are placed in the lowest class, many species, as sharks, rays, and sturgeons, representing in their gristly backbones, uneven tails, and spiny or plated skins, the armoured ganoids of Silurian and Devonian seas, which are the earliest known vertebrate forms and mark the gradations between cartilage and bone in structure. But the vaster number of fishes, perhaps embracing greater variety of form than any other class of vertebrates, are *teleost*, or bony-skeletoned, not breathing—as the worm-like lampreys, hags (in which gristly arches for enclosing the nerves appear on the notochord), sharks, and their allies—through holes or slits in the neck, but through gills.

Just as we had to retrace our steps in search of a link between vertebrates and invertebrates, so we must again go back a step or two to find the intermediate forms between aquatics and amphibians. These forms are represented by certain fishes called *Dipnoi*, or "double-breathers," because, while they have gills for taking up the oxygen from the water, they can also breathe on land by means of the air-bladder or sound, which thus discharges the functions of a lung. Such are the *mud-fish* of the Amazons and the *jeevine* of Australia, both of which show tendency towards modification of the paired fins into limbs, those of the mud-fish being thong-like, and those of the jeevine jointed for locomotion on land. Other fish, as eels and the climbing

XUM

perch of India, can also leave the water, but their breathing is effected by special organs connected with the gills.

Here, then, we find the intermediate step between land-dwellers and water-dwellers, the most perfect and familiar example of which is supplied by the common frog's life-history. The gill-breathing, limbless, tailed, plant-eating, aquatic tadpole develops into the lung-breathing, four-legged, web-footed, tailless, animal-eating, amphibian frog, unable, save when torpid, to live in water without coming to the surface for air. Some *amphibians* possess both lungs and gills throughout life, but all the higher vertebrates, whether they live in water or not, breathe through lungs, which arise, like the air-bladder of fishes, as sac-like outgrowths of the primitive gullet.

Reptiles, which include forms as diverse as the nimble lizard, the sluggish crocodile, and the limbless snakes, are for the most part the relatively insignificant descendants of the monsters of the land, air, and water, that flourished in the age of reptiles amidst the dense vegetation of a swampy world until conditions fatal to them, and favourable to the development of higher life-forms, supervened.

Although the exact sequence of *birds* in the appearance of vertebrates is unknown, their descent from reptiles is certain. Not, as might be thought, from the flying species, for these were featherless and more like bats than birds in the membraneous wings which stretched from limb to body, but from species that walked upon the land. But, although structural likenesses between birds and reptiles survive to attest this former close relation, as *e.g.* the union of the skull to the spine by a single joint, instead of by two joints as in most amphibians and in all mammals, and the union of the skull to the jaw by the quadrate bone, which enables the jaws to be opened very widely, manifold causes, working through long periods, have brought about marked differences of external and internal structure. Notable among these is the modification of the three-chambered heart of nearly all reptiles into the four-chambered heart of birds and mammals, by which the fresh and used-up blood are kept separate, and the higher temperature of the body maintained. The scales of the one, and the feathers or furry covering of the other, are alike modifications of the outer skin; for although the intermediate stages between the plumage of birds and the horny plates of reptiles are missing in fossil remains, it is certain that these and kindred structures, as well as claws, nails, and hoofs, are all outgrowths of the skin; even the teeth, the variety of form and arrangement of which renders them of great value in determining the habits and general structure of the animal to which they belonged, being secreted from the skin. It has been shown already that the nerves are also formed from the skin, nor should the variety of function which it discharges, and therefore the variety of structure into which it is modified, surprise us when we reflect how continuous has been the action of the medium with which it is in immediate contact upon the external surface of all organisms, so that the slight film or integument of the lowest has developed into the complex layers which enclose the highest.

Space prevents enlarged reference to the significant proofs of the development of birds as compared with their reptilian ancestors in larger proportion of brain to body, with the intelligence which this connotes, a remarkable proof of which is in the wide range and method of their migrations, involving powers of vision and memory exceeding that possessed by man. On this matter Darwin remarks: "How a small and tender bird coming from Africa or Spain, after traversing the sea, finds the very same hedgerow in the middle of England, where it made its nest last season, is truly marvellous."

The lowest members of the diversified group of *Mammals* or *milk-givers* resemble birds in being toothless, and in having a common sac into which the intestines and other organs open, for which reason they are called *Monotremes* or *one-vented*. These animals are represented by the Ornithorhynchus,* or *Duck-bill*, a beaver-like creature with a horny bill, and feet furnished with both webs and claws, and by the Echidna, or *Spiny Ant-eater*, which resembles a large hedgehog, being snouted and covered with prickles. Each is found in Australia, that land of primitive forms, and recent discoveries invest them with the greatest importance as links in the chain of mammalian descent. For they both lay eggs like reptiles and birds, the duck-bill laying two at a time, which she deposits in her underground nest, and the echidna laying one, which is probably hatched in her pouch. And the eggs further correspond with those of birds and reptiles in having not only the yolk from which the embryo is formed, but the yolk-sac containing the food on which it is nourished until hatched, when it lives on the milk which the mother pumps from her teatless glands until it can shift for itself. Now an animal that unites in itself these reptilian and mammalian features is to be classed among the interesting anomalous and intermediate forms which Darwin has happily termed "living fossils." Whether monotremes are descended in direct line from reptiles, with the internal structure of which they have much in common, and mammals from monotremes; or whether there was an ancestral form or root-stock from which both reptile and mammal branched off, so that mammals are as old as reptiles, and older than birds, is not clear, although the rocks may one day reveal it. But the interrelation of reptiles and mammals is proven beyond question.

The next stage in mammalian development is marked by the *Marsupials* or *pouched milk-givers*, as kangaroos and opossums, the young of which are born in an imperfect condition, and nourished and kept in the mother's pouch till they can run alone. Their fossil remains evidence to a wide range in Triassic times, and the Post-Pliocene beds of Australia yield bones of marsupials as large as elephants; but their habitats are now limited to that island continent and to lands similarly long isolated.

In all other mammals the young are born fully formed, being attached during the time of their development within the mother to a structure called the *placenta*, through which they are nourished by her, whence the general term placental mammals. Starting thus more or less fully equipped in the struggle for life, the chances in their favour were incomparably greater than those of animals which are precariously hatched or born in an imperfect state; hence, among other causes, the dominance of the placentals and their development into the highest organisms yet reached.

They are usually divided into the following classes, which indicate structural characters common to the animals included under each, and not the relative place of any class in the sub-kingdom. No linear arrangement of classes, nor, sometimes, even of species, is possible, for the succession of forms is not as that of steps of a ladder, but as of a many-branched tree.

1. Toothless (*Edentata*)	Sloths; ant-eaters; armadillos. These show affinities linking them nearer to monotremes than to marsupials.
2. Sirens (*Sirenia*)	So-called from their fancied resemblance to mermaids or sirens. Dugongs and manatees, or sea-cows; fish-like in form, the fore-limbs modified into paddles, the hind limbs absent; both of these are flesh-feeders.

* *Ornithorhynchus paradoxus*, the older naturalists named it, for when they were assured that the creature was not a fraud of the stuffer, they thought it must be a freak of nature.

3. Whale-like (*Cetacea*)	Whales; dolphins; porpoises; also adaptation of structure to aquatic life.
4. Hooved (*Ungulata*)	Very numerous and valuable order. Divided into the *odd-toed*—as the horse, the tapir, and his near relation, the rhinoceros; and the *even-toed*—as swine and their near relation, the hippopotamus; camel; deer; sheep; ox; all these are plant-feeders.
5. Hyrax or Rock-Rabbit (*Hyracoidea*)	Represented by a small animal, the coney of the Bible. The shape of the teeth points to affinities between hoofed animals on the one hand and gnawing animals on the other.
6. Trunked (*Proboscidea*)	Represented by the elephant, the longest-lived and most acute of plant-feeders.
7. Flesh-feeders (*Carnivora*)	Seals; bears; weasels; wolves and other members of the dog family; lions and other members of the cat family.
8. Gnawers (*Rodentia*)	Hare; rat; beaver; squirrel. A very widespread class.
9. Insect-feeders (*Insectivora*)	Mole, hedgehog.
10. Finger-winged (*Cheiroptera*)	Bat, highly organised and closely allied to insect-feeders.
11. Lemurs (*Lemuroidea*)	The lemurs are sometimes grouped with monkeys in the order of the "four-handed," a division falling into disuse; but they have marked affinities with marsupials, gnawers, and insect-feeders. The "flying lemur," or colugo, a squirrel-like creature with webbed hands, appears to be an interesting link between insect-feeders and primates.
12. Primates	Monkeys; baboons; man-like apes (gibbon, ourang-outang, chimpanzee, gorilla), big-jawed, small-brained, stooping posture; Man, big-brained, erect posture—divided into races according to shape of skull, colour of skin, nature of hair.

In the past and present life-history which has been summarised in this and foregoing papers, no break in the continuity of life, or in its fundamental unity, is found. In the unstableness of the first living matter lay the tendency to that variation which, acted upon by manifold agencies in the production of unlikenesses both seen and unseen, has resulted in ever-increasing complexity of forms. But it is not easy, in the disconnected shape in which these papers are presented, to keep clear and constant before the reader the relationship between all life that is and that has been, as well as the identity of that life with, and its dependence upon, the not-living. Perhaps this interrelation may be made more apparent in the exposition of the theory of evolution which is now to follow the description of the things evolved.

End of Part I.

PLEASANT HOURS WITH THE MICROSCOPE.

By Henry J. Slack, F.G.S., F.R.M.S.

THE subject of bacteria in connection with health and disease not only continues to occupy the attention and perplex the endeavours of scientific men, but, as articles in the daily papers show, interests a large circle of readers who are too often supplied with statements wide of the true mark. Anybody who has a microscope can easily become acquainted with the leading facts and principles of these researches. A few globules of yeast in a little sugar and water in a small cell placed on the stage of the microscope in a warm room will bud (pullulate) and multiply under the eye of the observer, and, as every one knows, a rearrangement of the molecules of the sugar occurs, resulting in the giving off of carbon dioxyde (carbonic acid) and the formation of alcohol. All fermentations resemble this one of yeast. They are results of a ferment which is a minute plant feeding itself at the expense of the substance fermented, and causing the molecules it does not want for its own subsistence to arrange themselves in new patterns. When beer turns sour little ferments have acted upon the alcohol and made vinegar; when butter turns rancid a ferment has been the cause; and when a bit of meat putrefies other ferments have combined to pull the whole complicated structure to pieces, and all except the mineral constituents are dispersed in the gaseous state.

The products of fermentation may be wholesome, as in the case of leavened bread, or may be highly injurious; and when a physiologist is endeavouring to trace out the cause of an infectious or contagious disorder, he must distinguish between the operation of the microferments themselves and that of the new combinations to which they give rise. If a man gets drunk upon fermenting beer no one accuses the little yeast plants of upsetting his equilibrium, because the specific action of alcohol quite free from yeast is well known. In numerous cases of what are called zymotic diseases the exact chemical change produced by the ferments is not known, and it requires great skill and many trials to find out what the ferments alone can do in the way of injuring healthy animals into whose system they are introduced.

One difficulty occurs at the very threshold of the inquiry. Many little ferments are so commonly and widely disseminated that it needs great care to keep them out. For example, brewers frequently have large quantities of beer spoilt because, besides the yeast ferments which they want, others get in which induce a fresh or destructive fermentation immediately after the yeast plants have caused the right one. Wine-makers are exposed to similar losses, as it frequently happens that they cannot exclude the mischief-makers. In that case Pasteur counselled destroying them by boiling. This saves the wine in a drinkable state, but it will no longer improve by keeping and acquire those aromatic properties known as its *bouquet*.

Many of the disease ferments are difficult to discern with the highest powers, partly from their extreme smallness, and partly from their being of nearly the same refractive power as the fluid in which they are immersed. To make plain this question of refraction to those who have not studied optics, let the difference be noticed between the visibility of a piece of glass immersed in clear water, and the impossibility of recognising a spoonful of water poured into a tumbler of water of the same temperature. A drop of alcohol is distinguishable from water into which it is thrown until it gradually mingles with that fluid and is lost in it. Sometimes a micro-ferment, like the bacterium of tubercular diseases (consumption, &c.), can be made visible by staining with an aniline or other dye. Ferments that are easily seen, and others much more easily not seen, may be in the same fluid, and it has often happened that some experimenter has ascribed to the things he saw the work done by those he did not see, and whose existence he did not suspect. Let us suppose an experimenter has contrived to obtain a pure specimen of fluid containing a specific micro-ferment; his troubles may then begin. To get it in a position ready for the microscope he puts a drop on a glass slide, which ought to be perfectly clean, and not to hold any object that could be mistaken for a micro-ferment. Any ordinary person would be offended if told they could not clean a piece of glass, but making anything perfectly clean is a task requiring considerable manipulative skill. A piece of glass may be washed with strong acid, capable of

destroying most organisms; it may be heated in the flame of a spirit lamp, capable of burning any animal or vegetable substance. It is then presumed to be ready, but the air of the room may deposit some germ upon it; the human breath may do it; it could not be touched on its surface with the cleanest finger without detriment to its complete purity; no instrument such as a glass rod can be safely used to convey the bacterium it is desired to observe and nothing else, unless it has been in the flame of a spirit lamp immediately before its use. Experimenters, like Pasteur, investigating the air of mountain heights, take up with them sterilised fluids fit for the growth of bacteria, &c., in glass bottles, hermetically sealed, and drawn out with narrow necks. They break these necks to let in the air, and then seal them up again with a spirit lamp. But the nippers with which they break the necks may have germs adhering to them, and they must not be used till they have been passed through the hot spirit flame.

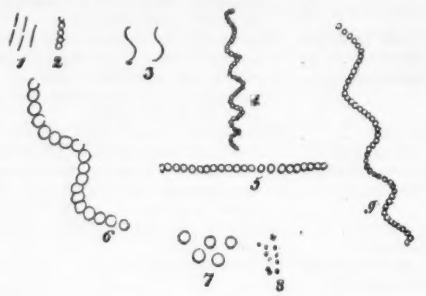
In a case of Dr. Sternberg's his object was to ascertain whether a rabbit was killed by micrococci (round forms of bacteria) or by the poisonous action of the fluid in which they were swarming. He accordingly introduced less than one minim of the fluid with the micrococci in it, with sixty times its quantity of a nutritive fluid, which he had sterilised by heat. He thus grew a fresh crop of the little ferments. Repeating this process eight times, the quantity of the original fluid was lessened each time, until at last it only formed one part in 1,679,611,600,000,000, "yet a few minims of this eighth culture possesses all the virulence of the first." The virulence thus belonged to the micrococci, and not to the original fluid.

In one case of supposed discovery of a ferment of disease the error arose from the glass slide containing in very minute cavities extremely fine particles of rouge used in polishing it, and which were taken for bacteria.

The artificial culture of micro-ferments may be made in infusions of animal or vegetable matter sterilised by heat, or in chemical fluids, such as

Distilled water,	2 c.c.
Phosphate of potash,	0·1 gramme
Sulphite of magnesia,	0·1 „
Tribasic phosphate of lime,	0·1 „

The general student who wishes to understand the nature of micro-ferments, and to appreciate the labours of specialists, can do so without much trouble or inconvenience. An infusion of hay will supply several forms; yeast is easily obtained, and, where there is no handy place to keep offensive putrefying infusions, enough may be done by operating on small quantities, although, as the researches of Dr. Dallinger show, keeping considerable quantities for a long time is the only way of obtaining some forms. As new readers are continually studying the pages of Knowledge, we reintroduce for their benefit some figures which appeared in the number for June 1, 1883. Nos. 1 and 2 represent the bacterium of tubercular disease multiplied respectively about five hundred and one thousand times; 3 is a common form in the scum of infusions; 4, a spirillum considerably magnified; 6 and 9 are other forms; 5, a long bacterian form; 7 and 8, spores and micrococci. Sometimes various little organisms occur in masses of gelatinous matter, which have been called "zoogloea." This happens with many species. The little round forms can only be distinguished from one another by watching their development, which often takes a shape widely differing from the original germ. Dr. Dallinger has traced the existence of whips as motive organs in spirillum and other forms. In many cases this is quite beyond the powers of ordinary students, as it can only be done with very costly objectives and the exercise of long practised and great manipulative skill. In operating with ordinary powers and upon common species, the student must avoid excess of light. It is well to point the microscope so as to receive light direct from a lamp turned edgewise, and through a very small hole of a



diaphragm or condenser, say, one-thirtieth of an inch in diameter.

To counteract the malefic effect of disease-producing ferments there are two courses: one, to kill them by some substance that poisons or otherwise destroys them, the other by rendering the fluid in which they live unfit for their propagation. Acetic acid is reported as having little effect as a germicide. Alcohol also has small value as a germicide. Camphorated alcohol is said by Dr. Sternberg* to be trusted by French surgeons to purify their instruments, although while it kills some mischievous organisms it does not affect others, such as the bacterium of anthrax (wool-sorters' disease). Arsenious acid is not fatal to all forms. Carbolic acid, in the proportion of 1 to 200, destroys *B. termo* and the septic micrococcus in active growth, while 1 : 25 failed to destroy bacteria in broken-down beef-tea. Eucalyptol, the active matter in the blue gum of Australia (*Eucalyptus globulus*), retards, and in some cases stops, the development of bacteria. Ferric sulphate is mostly useless as a germicide, but good as an antiseptic. The same may be said of boracic acid, which, as proposed by Barff, is an excellent preservative of all kinds of food. The heat death-point of these ferments varies greatly; 140° F. will destroy many, but some resist a temperature considerably above the boiling-point of water. Spores of *B. subtilis* in hay infusion are said to withstand boiling for five hours.

A very curious question arises concerning the protective action of inoculation and vaccination. Do they make some permanent change in the vital fluids, or how do they act? Dr. Steinberg says that if the first theory is true, the flesh of a protected animal made into broth ought not to suit the growth of the organism used in the protective inoculation; but this is not sound reasoning, inasmuch as dead broth is not the same thing as the fluids in a live and healthy organism. No conclusive explanation has yet been given.

Poker Pickings.—The judge, the sheriff, the coroner, and the chief of police of Red Gulch, were engaged in playing poker. The pot was pretty large, and considerable excitement was manifested in the outcome. The judge "called" the sheriff, who casually remarked—"I hold four aces. What do you hold?" "I hold a bowie knife," promptly returned the judge, as he perceived a fifth ace in his own hand. "And I hold a six-shooter!" exclaimed the chief of police, as he realised that he was not destitute of aces himself. . . . After an interval of about five minutes the coroner crawled out from under the table, saying—"I hold an inquest, and I guess that takes the pot."

* "Bacteria," by Sternberg.

INDIAN MYTHS ABOUT NIGHT.

By "Stella Occidens."

INDIAN folk-lore contains many curious myths with regard to night, which differ according to the imaginative powers of each tribe. Some of those here dealt with have been touched on in preceding papers. But in point of fact, such stories present themselves in many different forms.

Among the Algonquins, night is supposed to be a deep and mighty river leading to caverns of darkness, whereas the Dacotah tribes imagine that it is a silver lake leading to the abodes of the blest. The Ottawa tribes believe that night conceals by a veil of darkness a deep chasm which separates the known from the unknown regions; and among the Iroquois night is a dark river, guarded by a wicked magician and serpents. In the Hiawatha legends Longfellow describes it as

> the black pitch-water
> . . . . . .
> Lighted by the shimmering moonlight.

The Zuni and Oraibi myths are quite unlike the above, as it was a firm belief among these tribes that at one time the earth was always covered by darkness. The Zuni traditions are jealously guarded by the priests, and read aloud every four years in their presence. During a recitation which occurred in February 1881, the following abstracts were made from memory by Mr. Frank H. Cushing. Although greatly condensed, they were pronounced correct by one of the above-mentioned priests.

The account begins with the following characteristic words:—"In the days when all was new, when men lived in the four caverns of the lower regions. In the lowermost one of these, men first came to know of their existence. It was dark: as men increased they began to crowd one another, and were very unhappy." After awhile the "Holder of the Paths of Life," the Sun-father, created two children, whom he sent on earth for the good of men. He gave them a bow (A-mi-to-lan-ne, the Rainbow) and an arrow (Wi-lo-lo-a-ne, Lightning) and a shield of network, in the centre of which was a magic knife. The children were borne down upon the shield net into the caverns where all men dwelt. They listened to the prayers of the priests, and, building a ladder to the roof of the first cave, they widened the hole through which they had come with their magic knife. Later on, men were led into the third cavern, which was still larger, "and like twilight, for the light of the sun himself sifted down through the opening." To these poor children of the dark, the opening seemed like a blazing sun. As time went on, men multiplied as before, and once more prayed for light, and on account of these prayers they at last saw the "light of their father, the sun."*

There is a great resemblance in this myth to the Oraibi myth. The philosopher of Oraibi tells us that when people ascended by means of the magical tree, which constituted the ladder from the lower world to this, they found the firmament (the ceiling of this world) low down upon the earth (the floor of this world). Mateito, one of their gods, raised the firmament on his shoulders, to where it is now seen. Still the world was dark, and the people murmured. Mateito said, "Bring me seven maidens. Bring me seven baskets of cotton-bolls." He taught them how to weave a wonderful fabric, which floated away on the breeze, and became the moon and stars. The people still grumbled because it was cold, so Mateito, sending for buffalo robes, wove a wonderful fabric, which the storm king carried into the sky, and it became the sun.*

The comparison of night to caverns of darkness also occurs in a Micmac legend, concerning Glooksap, who sailed through them in his canoe.

"Now, having made a canoe, the Master (Glooksap) with Marten and Dame Bear, went upon a mighty river. As the story says, it was broad and beautiful at first, and they sailed down towards its mouth. Then they came to great cliffs, which gathered round, and closed over them. But the river ran on beneath these, and ever on, far underground, deeper and deeper in the earth, till it dashed headlong into rapids, among rocks, ravines, and under cataracts, which were so horrible that death seemed to come and go with every plunge of the canoe. And the waters grew narrower and the current more dreadful, and fear came upon Marten and the woman, so that they died. But the Master sat with silent soul, though he sang the songs of magic. So they passed into the night, but came forth again into the sunlight, and there was a lonely wigwam on the bank, into which he bore Marten and the grandmother, saying, "Numchahse!" (which means "Arise!") and lo! they arose, and deemed they had only slept. Glooksap had now gained the greatest power.†

The Algonquins believe that night is a mighty river, and that Manabozho, the Great White One, sailed across it, in pursuit of a wicked magician who had slain his grandfather.‡ This magician lived on the opposite side of the Great Lake, and his wigwam was guarded by a shining Manito and fiery serpents. The Manito was the Great Misshikabikib, the prince of serpents, and the great power of evil. After a desperate struggle Manbozho conquered him, and returned home in triumph. Almost the same account is given of Hiawatha in the Iroquois legends. He, likewise, determines to revenge the death of his grandfather. He sailed away towards the west, and soon he saw the fiery serpents, "breathing fiery fogs," so that none could pass them. Hiawatha destroyed these serpents with his bow and arrows (thunder and lightning). He then smeared the sides of his canoe with oil, so that he might pass the black pitch-water.

> Westward thus fared Hiawatha,
> Toward the realm of Megissogwon,
> Toward the land of the Pearl-Feather.

The magician is overcome by the mighty Hiawatha after a fearful struggle, and then returned—

> Homeward, through the black pitch-water,
> . . . . . .
> With a shout, a song of triumph.§

An Ottawa legend relates the adventures of five young hunters and a boy about ten years of age, called Ioscoda. They determined to visit the sun and moon. After they had wandered for many days through many lands, and were footsore and weary, they at last saw the spirits Shéshegwun. They were soon overtaken by the darkness, and asked for shelter at a large building on the borders of a mighty plain. Here dwelt a Manito, who gave them shelter, and likewise very good advice when they told

* "Bureau of Ethnology," Smithsonian Institute, p. 13, 1881. (Zuni Fetishes and Customs.)

* "Bureau of Ethnology," Smithsonian Institute, p. 26, 1880.

† Leland, "Algonquin Legends," p. 61. A comparison might be made between the above myth and that of the fish-god Dagon, "who swam nightly through subterranean waters to appear eastward again at daybreak, where he strikes down the oppressor, who has held him in bondage." Fiske, "Myths and Mythmakers," pp. 19, 24.

‡ Brinton, "Myths of the New World," p. 173.

§ Schoolcraft, "Hiawatha Legends," p. 21. This story was related to Schoolcraft in 1882 by the Chippewas of Lake Superior.

XUM

him the object of their journey. "Soon after you leave this place you will hear a deafening sound; it is the sky descending on the edge, but it keeps moving up and down. When it moves up, you will see a vacant space between it and the earth. You must not be afraid. A chasm of awful depth is there, which separates the unknown from this earth, and a veil of darkness conceals it. Fear not. You must leap through, and, if you succeed, you will find yourselves on a beautiful plain." All happened as he said, and Iosco and his companion leapt in safety; but two of the hunters who were afraid made a weak attempt. As they jumped, the sky struck the earth with great violence, and they were forced into a black chasm. Those who had reached land in safety found themselves in a beautiful country, lighted by the moon, which they could see approaching from behind a hill, &c.*

NOTES ON AMERICANISMS.

By Richard A. Proctor.

A DIGRESSION, WHICH MIGHT IN PART HAVE BEEN A PREFACE.

A WRITER in the *Saturday Review*, of July 31 (a date which I observe) deals with my "Notes on Americanisms," in the amiable style which that paper affects. The *Saturday Review* too often seems to demand from its writers a touch of personal malignity, not caring particularly whether the feeling has arisen from anger at some real cause of offence or is due to meaner motives. Whether the *Saturday Review* is fair towards me the reader shall judge. For his unfairness my critic may have as an excuse that I have (unwittingly I am sure) offended him; or, as a reason (which would be no excuse), that I have condemned with a deserved severity some offence of his. But he may be merely moved by envy, or (more probably still) he may have received at my hands nothing but kindness, and be angry with me because I have been so far fortunate as to be able to render it to him: I have known such cases.

My critic opens with the remark, by way of a mild jest, that I am somewhat unpatriotic in touching on "Americanisms" just now when the fisheries dispute between the United States and Canada is "in an inflamed condition." In the old country this dispute has not attracted quite so much attention as in the States, or in the States as in Canada—so that the joke falls rather flat. My critic knows pretty well, too, that the "Notes on Americanisms" were begun before the dispute began. I observe his reference to this matter.

He goes on to remark that in my "notes" I reveal my hatred of Poker, which he calls America's national game. One who thus insults America (for Poker is not a game of which American gentlemen are proud) cannot have been born under the Stars and Stripes. I *have* expressed contempt for a game which—*as played for money*—is fit only for horse-thieves and cow-boys. The *Saturday Review* finds here a neat opportunity for somewhat womanish spite. He remarks that I "do well to eschew Poker, since it requires coolness of temper, and knowledge of human nature." Were I as warm as he, I might be excused for retorting, with possibly more truth, that he naturally values Poker, since it requires for success chiefly a false face. Suffice it to remark, however, that I observe this comment on Poker.

Taking in hand my "Notes on Americanisms," my critic remarks, somewhat clownishly, that "Mr. Proctor has been at it again." "With delightful self-satisfaction," he says (I observe this word), I have attacked this subject even as Lord John Russell might have taken command of the Channel Fleet, or have undertaken to write a Zola novel. My want of due modesty is chiefly shown, it appears, by my having originally taken Bartlett's "Dictionary of Americanisms" for my guidance. And because, as I proceeded, I recognised many of the mistakes which (I find) Grant White had also noticed, the *Saturday Review* charges me with absolute want of knowledge as compared with Bartlett's half knowledge.* I should imagine my critic was an Irishman, only I know better.

When I am in doubt about an Americanism I say so ("a virtue that was never seen in" the Hotspurs of the *Saturday Review*). This my critic naturally denounces, presenting it (again *Hibernice*) as part of the evidence of my "delightful self-satisfaction." Take the word a "bit," as used in America. I do not know the true meaning of this word, and I honestly admit as much. *Therefore* the *Saturday Review* snarls that neither do I know the real meaning of many other words I set down. But why did not my critic define "bit"? He *ought* to know what the word really signifies, for he *probably* does not know *too much* about it. During my travels in America I have visited almost every State, and so have heard the word "bit" used in all its various ways, and remain doubtful which has the greatest weight of authority in its favour.

My critic next repeats the weak objection that many of the words included among my "Americanisms" are heard in England, or have been in the past. I repeat (see "Gossip" for April last) "I know it." "I guess" is good old English. I have met with it in at least a score of old English books, from Chaucer to Locke, yet even my critic would hardly deny, I suppose, that to say "I guess," is now distinctly an Americanism. So with "I reckon," "I calculate," and the rest. So also with the expressions selected as examples by the *Saturday Review*. The cockney, if ill-educated, says "I feel bad," when he means "I feel ill." I know that as well as the *Saturday Review*, being by birth a cockney myself. I have never heard a cockney say "I feel good" for "I feel well," or rather for "I am enjoying myself." But in any case both these expressions are rightly described as Americanisms by any one who, having lived in America, has had an opportunity of noticing how much more familiarly used they are in America than in England, and how frequently you hear them used by persons who are not ill-educated. The word "bullyrag" is really old English in origin, and now rather Irish than American in usage. Still it is so much more commonly heard in America than in the old country, that it is properly included among Americanisms. I omitted it in my first list (published when Knowledge was a weekly journal), and my attention was called to it by three or four correspondents, including one well-known American author. "Dicker," to bargain, is ancient and honourable, as English, says my all-knowing critic. Every one knows that. Lowell

* Schoolcraft, "Hiawatha Legends," p. 289. The idea of night coming down on the earth is referred to figuratively in a hymn used in the Catholic Church—

> Dark night hath come down on us, mother, and we
> Look out for thy shining sweet star of the sea.

Such references to natural phenomena are significant.

* Grant White's superior knowledge of the relative peculiarities of English and American English may be inferred, perhaps, from his essay, showing that forty years ago Englishmen *all* dropped their h's, and his attempt to prove this by the use of such expressions as "an hundred," "an hosier," "an hotel," in English writings. I venture to back my acquaintance with this particular subject against Grant White's, who was, indeed, but a shallow and pretentious writer, and naturally, therefore, arrogant and insolent.

pointed it out (quite unnecessarily) long ago. But the word is an Americanism now. It is never heard in England except as a provincialism. It does not appear in any English dictionary, from old Walker to the modern and most excellent Annandale. On the other hand, it is quite commonly used in America; it appears in many American books, and it is given both by Webster and by Worcester, the two chief American lexicographers.

To "elect," in the sense of choosing one of two alternatives, is only "a literary vulgarism," not an Americanism at all, says my critic, who ought to be a judge of vulgarisms. So the expression "at it again" is a vulgarism, yet, as it is a vulgarism very commonly heard among clowns, we call it clownish. In a similar way, "elect," in the sense referred to, is much more commonly used in America than in England, and is properly called an Americanism.

Having indulged in this puerility, which would exclude ninety-nine out of a hundred of the most characteristically American expressions, my critic takes me to task for what he pretends to regard as mistakes. After "bullyragging" me as he has, he ought to find "dozens" (his own word) of bad blunders, and let us see how many he does find.

He says, I "fail miserably" in defining Chowder as a dish consisting "of fish, pork, onions, and biscuit"—"a most inaccurate definition of a most delicious dish." (I remark the womanish "most delicious.") Considering that Grose, Bartlett, Webster, and Worcester agree in defining "Chowder" as I have done, I venture to consider the definition probably sufficient. Possibly my critic may have tasted some less usual form of Chowder. But if I had said that Chowder is a dish in which "birds, squirrels, crayfish, potatoes, onions, pork, fish, biscuits, and a number of other articles of food are cooked together in a camp-kettle," I should have been describing a special Chowder as distinguished from ordinary Chowder—substituting my special experience for the more generalised experience represented in the definition given by Webster and Worcester. As for the derivation of "Chowder" from a Canadian corruption of *chaudière* (a matter which could only interest a Canadian), my "Notes on Americanisms" have little to do with such points. I observe this second Canadian touch.

He next takes the word "Bonanza." The word is applied in California to the discovery of a rich vein of gold or silver; and the name came into general use in that sense soon after the discovery of the great silver mines on the Cornstock lode. So much the *Saturday Review*, borrowing from the despised Bartlett, is careful to explain; and so much I might easily have stated without borrowing—though, had I been ignorant of the facts, there was Bartlett before me to set me right. I omitted it, however, for two excellent reasons. First, I supposed every one knew it;* and secondly, the use of the familiar word in that sense is not an Americanism—it belongs to the slang of miners and stock speculators. The word "Bonanza" is only an Americanism in the sense in which I defined it. The *Saturday Reviewer* says the point is completely missed by me; it is really missed by himself. If he had lived, as I have, where the word "Bonanza" has come to be used as a true Americanism, he would know that it has just the significance I have given to it. But his acquaintance with Americanisms is evidently local—not to say provincial—and far behind date. Down east, or in Canada, they might make such a mistake; not where I live—in the very heart of the United States. I observe this blunder, however, attentively.

With the most obvious desire to smash and pulverise my "Americanisms," these are positively all the words on which my weak, though spiteful, critic can comment unfavourably. He notes only one omission—"buzz saw" for circular saw. Friendly correspondents have earned my thanks by noting at least a dozen, which will hereafter be added in a short list alphabetically arranged. I have no doubt many more will be noted. My critic's failure to show worse faults involves the highest commendation he could pay me.

And now let me touch on the question whether, as my critic asserts, I am going entirely out of my way in dealing with Americanisms. I wonder whether every student of science who has dealt with subjects seemingly outside his province, could indicate quite such special study of them as I have given to this one. Our contributor, Mr. Grant Allen, for example, whose graceful and generally sound essays on a singularly wide range of scientific subjects we have all read with pleasure—could he, I wonder, give an equally good *raison d'être* for his novels* as I am about to give for my "Notes on Americanisms"?

The readers of KNOWLEDGE know that in commencing these papers I did not *claim* any special knowledge of the subject, only great interest in it. I even stated that I should take Bartlett for my guide, supposing that I should find him trustworthy, though in reality I merely proposed to use his book as giving a convenient alphabetical arrangement, by running along which I should probably get in all the words requiring to be dealt with. If, however, I had wished to indicate exceptional study of the subject, I might have made out a rather strong case. To say that my critic has not had a tithe of my opportunities is to say nothing; for evidently he has only picked up a few words from the pretentious pages of Grant White, which he uses after the manner advised by Sam Slick for deceiving the inexperienced. But I might ask fairly enough, if there are twenty men living, if there are ten, if there are *two*, who can match my own opportunities for obtaining that kind of knowledge about Americanisms to which alone I (*and only now for the first time*) lay claim.

I have been from my boyhood upwards a loving reader and student of old English writers from the time of Gower and Chaucer to the pre-Shakespearean dramatists. I have read with equal zeal the writings of those who, from the time of Bacon, Hooker, Spenser, and Shakespeare, to the end of the eighteenth century, give us, on the whole, the best means of forming an idea of the English which the first settlers in America took with them. Besides this, and very wide reading of modern English literature, I have taken especial interest in all matters of dialect and provincialisms, including the English of Scotland and Ireland. It so chances that I have resided in more parts of the British Isles than most Englishmen know much about. Born in London (in the house where Carlyle died), I heard a good deal of the London dialect in early boyhood. I lived many years in Kent, and have been a householder in Ayr, Edinburgh, Blackrock (Dublin), Falmouth, Plymouth, St. Helier's (Jersey), Brighton, Kew, Woolwich, and elsewhere, residing as a visitor in many other places, and travelling, during my lecture tours, to almost every nook and corner of the British Isles, with abundant opportunities for hearing and learning about local dialects. So much I note, because no one is com-

* The "Big Bonanza" must have been acted before three millions of folk, and discussed in papers reaching twenty millions more. No one needs to be told the original meaning of this Spanish word, or about its first application to mines.

* I see no reason why a science writer should not write a novel, if he can write a good one, or even one to sell. Why, for instance, should the skill with which Mr. Grant Allen makes science "very popular" in the *Cornhill*—keeping her even on the broad grin—cause us to distrust the "delightful self-satisfaction" with which he scatters "most delicious kisses" broadcast through "For Maimie's Sake"?

XUM

petent to discuss Americanisms who has not made rather exceptional acquaintance with the literature of the old country and the dialects of its various parts.

All this, however, would be useless without an exceptional acquaintance with America. On this point I remark, in the first place, that I have read, I think, everything written by Americans which may be regarded as having taken a place in literature. Next as to my personal acquaintance with America and Americans:—I first reached America in October 1873, and stayed there seven months, giving 104 lectures and visiting most of the chief cities of the Eastern and Northern States, but getting no further west than Missouri. I had all the time exceptional opportunities for hearing Americans talking—from continuous conversations (occasionally even more than I desired) on railway journeys, to most agreeable converse at the clubs; at receptions, at entertainments, in special gatherings for discussion, on the cars, in river steamboats, and under abundant varying conditions, I heard and noted Americanisms by the thousand in all classes of society. From October 1875 to May 1876, I had similar opportunities, travelling at this visit as far west as Nebraska and as far south as Kentucky, and giving 146 lectures. From October 1876 to May 1880 I gave 138 lectures in America, going over to the extreme west, and closing the tour with a fortnight in San Francisco. Returning from Australasia in January 1881, I gave more lectures, raising my total almost exactly to 500, chiefly in the west, but I ranged over to New York (State), New England, and Canada, closing the course at Greencastle, Ind., on April 30. Thence I went to Missouri, where on May 3 I married a Missourian lady, daughter of a Virginian father and a Kentuckian mother, and related to many of the principal Southern families. Of the five-and-a-half years which have passed since then, about two-and-a-half years have been spent in America, chiefly in my own house at St. Joseph, Mo., on the bank of the Missouri—amidst a population in which almost every variety of American dialect is found, from the true Yankee to the purest Southern, the strongest Western, and the quaintest negro dialect. At my own table we sat down day after day twenty-two in number, four or five English, the rest Virginian, Kentuckian, Missourian, &c., most of us having travelled widely so as to know a good deal about other places than our respective homes. We were waited on by coloured women, two of whom had been slaves in the household of my wife's uncle. If the opportunities I then had for learning to distinguish the various colloquialisms which I deal with as Americanisms have been often matched, I shall hear with interest of the circumstances under which this has happened. But even this is not quite all. From August 1884 to May 1885, I was on a lecture journey again, accompanied by my American wife, and by my brother-in-law (the last, by the way, had had actual experience during many years of the mining life which my critic knows only from the dictionary definition of "Bonanza"). In this journey I lectured over a tract extending from Chicago to Houlton, Maine (extreme north-east), thence along New England, New York, and Pennsylvania, through Virginia, the Carolinas, Georgia, Alabama, Louisiana, Texas, so round the Indian territory and Kansas to my home in St. Joseph, Mo. During this journey I gave about 150 lectures, resided many days as a guest in the homes of my wife's relatives in Washington and Charleston, stayed at many of the most important cities of the South—four days in Richmond, Va., three in Wilmington, N.C., a week in Columbia, S.C., another in Mobile, Ala., three weeks in New Orleans, a week in Galveston (Texas), &c., &c., &c.,—and I had abundant opportunities not only for hearing Americanisms of all sorts, shapes, and sizes, but for discussing them with those who knew all about them, and appreciated my interest in the subject. I should have been a dullard had I not become exceptionally conversant with the Americanisms of the regions then visited. My critic may have been born in America, but assuredly he has never had one-hundredth part of my opportunities of taking and making "Notes on Americanisms."

In 1881, when I wrote my essay on "English and American English," I considered that few had had better opportunities than I to become conversant with the subject; but certainly among the few must be counted myself now as compared with myself in 1881. I may add that while I have a good memory for matters in which I am interested, I believe I am observant (in *such* matters) beyond the average.*

My "Notes on Americanisms," though thus the fruit of a most exceptional if not (as I think) unique experience, are in no sense ambitious. I leave it to my critic to talk "with delightful self-satisfaction" about "Political Americanisms" and Colonel Norton's glossary thereof, regarding political Americanisms as beneath contempt. (It will be noticed that I have diligently skipped nearly all of them thus far, in Bartlett's Dictionary.) I do not undertake to exhaust even the colloquial Americanisms, which are my chief, almost my only aim. I can, however, tell my critic what a "Horse Fiddle" is—which he puts as a test question—as understood out here in Missouri, where I am writing.

Charged with undertaking to write on a subject which I have not studied at all, I think I have succeeded in showing that it is a subject about which I can claim to know much more than most men, because of the altogether exceptional opportunities I have had for studying it. I certainly know much more about it than my critic. I might almost be tempted to say with dear old Reade, in wrath at the "anonymuncules of the press" (in the same half-jesting tone), "It is a subject about which I know *everything*, my critic *nothing*."

"SATURDAY REVIEW" BLUNDERS.

THE *Saturday Reviewer*, who professes to know so much about Americanisms, has brought out an article on the subject simply crowded with blunders.

My critic's first article—a month late as a criticism of the July number—appeared a week after the August number. Yet this second essay opens with the discovery that in Knowledge for August there are no Americanisms!

Observe,—five days before the proofs of the first article were corrected, the August number, which the writer of that article had not seen, was on every railway stall in England. Obviously both articles were written at a distance, and the later one was retouched, but not quite deftly enough, by a friend at headquarters. (The lateness of my own reply, writing as I do in Missouri, will be understood, as also the generosity of the critic who waited till he knew I had left England before opening an attack on a series begun four months before.)

This same opening sentence speaks of my "glossary of

* I noted such more delicate Americanisms as the "Why, certainly," of the East, the "I know it," where we would say in England simply "I know," the "won't you?" where we would say, "will you?" and so forth, in that earlier paper—years, by the way, before "the Colonel" had suggested the erroneous idea that, "Why, certainly," is a novelty, and an obtrusive one at that—as Americans say. So far as shown, previous visitors had touched only on the more glaring Americanisms: certainly Dickens had.

Americanisms" as "amusingly and amazingly inaccurate," oblivious of the fact that in the first article, intended to convey this impression, my critic could point out only one doubtful omission, and two supposed inaccuracies—really his own. As there are upwards of two hundred words in the first two sections out of four (I have counted no further) which the critic examined with his most unfriendly eye, I maintain that he has really proved the notes to be singularly accurate, so far at least as his opinion is concerned. Two bad potatoes in a plate may have a bad effect, but two only in four sacksful would have a very different significance. And, as I have shown, even the two words "Chowder" and "Bonanza" are correctly dealt with by me—the only blunders about them being my critic's.

Thirdly, my critic ventures to correct me for using the word "Americanisms" in its wider sense, instead of the absurdly narrow sense he prefers. I might limit my Notes (observe, by the way, how modest the word and how remote from the "glossary" he attributes to me) to "Americanisms made in America by Americans" and "foreign words left by former Spanish, French, and Dutch colonists"; but, on the one hand, I could not justify such a limitation, and, on the other, no one would take any interest in so paltry a collection as would have resulted.

And now for my critic's special blunders, some of which are amusing and amazing indeed.

1. Horse-fiddle. This is no more an Americanism than the "charivari" itself. For an English illustration of a noisy serenade, see Hogarth's "Idle and Industrious Apprentices," showing indeed that the custom was not limited of old times in England to purposes of annoyance. The use of the word "horse," as in "horse-laugh," to imply something loud and coarse, is not American at all. An English rough who made a noise-producing instrument, scraped bow-wise, would be sure to call it a horse-fiddle. But even as to the American use of the word and of the thing, my critic blunders. He describes the horse-fiddle as known only in New England, whereas it is known in every State of the north, the east, and the west. He describes only one form of it, whereas there are half a dozen at least, to my knowledge. He describes only one use of it, as the bass instrument in a "charivari," whereas it is often used as a convenient calling instrument. In Ohio, for instance, a horse-fiddle is (or was quite recently) used to call men and dogs together for the American form (utterly unlike the English) of a fox-hunt. The name is also applied to a coarse kind of Æolian harp, in which strings dipped in coal-oil are stretched across a suitable wooden case, a gruesome noise resulting when the instrument is placed where a strong wind can work upon it.

2. Hauled Mealer. My critic employs much space to explain that a "mealer" is one who takes meals, and that "hauled" means "conveyed in a vehicle." The blunder here consists in the amazing absurdity of supposing that any one wants to know about such Americanisms (save the mark!) as these. A member of my household calls a carriage dog a "plum-pudding dog." Shall I put that down as Missourian American? Another—very young—has invented the appropriate call, "Look at it! look at it!" when a masher, a white-chokered coloured man, or any other preposterous person appears. Shall I call the quaint cry an Americanism? I know a case where the word "death" is always used for "a common lot," as applied to a "crowd" (as Americans say). Shall that go down, too?

3. Time. My critic quotes Mr. Saintsbury as saying that many may regard the expression, "a glorious time of it," as an Americanism, whereas it is good old English. But it is not even old in the sense of being out of date. The expression is constantly used in every part of England. (In passing, though, I note that "time" is no longer used in England when its meaning might be understood as in Nicholas Nickleby's well-known retort; whereas in America there is no such objection to the use of the word, the meaning suggested by Mr. Nickleby not having come into use.)

4. Deck, for pack of cards. My critic carefully insinuates the untruth that I have here "set down as of American origin a word which is in 'Shakespeare.'" I referred to the *play*, *act*, and *scene* where Shakespeare uses the word! His blunder here consists in the feebleness of his *suggestio falsi*.

5. Peart. There is a similarly unwise untruth here. Bartlett mentions rightly enough that this word is "provincial in parts of England" (I have repeatedly heard it myself in Devonshire and Cornwall), and even quotes a passage from a letter of Sir Philip Sidney's. (I think Bartlett is mistaken in regarding "peart" as a corrupt pronunciation of "pert"; the fact really is that our "pert," pronounced "purt," is a corrupt pronunciation of "pert," properly pronounced originally like the French word *perte*. "Peert" and "peart," as now sounded, are corruptions of the "pearte" of Sidney's time, when "*ea*" and other words always represented the sound we retain now only in a few words so spelled—as, for example, "great.") "Pert" was derived from the old French *apert*, still remaining in *malapert*.

6. Reckon. "I reckon" for "I think," still used as a provincialism in England. Therefore our *Saturday Reviewer* would remove this from among Americanisms. The use of "reckon" in this way is only local in America. It belongs to the south, and rather specially to Kentucky. Albeit, neither consideration can properly exclude it from among Americanisms. It belongs, indeed, to the only class of Americanisms really interesting to study, for the evidence they give about old English words and phrases. This again (for a correction on Bartlett) is, as an untruth, emphatically feeble. Bartlett tells all about the provincial use of the word. In fact, my critic's second paper, by causing me to look somewhat carefully into Bartlett's pages, has greatly raised my respect for his work. He goes wrong about many English provincialisms not found in books, but where there is documentary evidence he has nearly always lighted upon it.

Like for "as." Another weak falsehood here also. Bartlett touches on the English use of this expression. The *Saturday Reviewer* puts its English use as out-of-the-way knowledge. I have heard it myself repeatedly, especially in Lancashire and Yorkshire, where educated people use it freely. It occurs also commonly enough in books. I differ altogether from Bartlett in regarding this as an Americanism at all, for it is at least as often to be noticed in England as in America.

Switch. Noun and verb. Here, following Bartlett, the *Saturday Reviewer* goes grievously wrong. Bartlett says the word is coming into use in England, but describes it as the American for the English "shunt." As a matter of fact, "switch" has been in use in railway-English since railways, and long before locomotives were invented. There is a real difference, however, in England between "switching" and "shunting" a train, which is not generally recognised. A train sent off to another line of rails is said to be "switched off," but a train is properly said to be "shunted" only when it has been switched off for the purpose of allowing another train to pass. The term "switch" is general, "shunt" particular. "Switch" is related to "swing," and "shunt" to "shun."

Molly Cotton-tail, for a rabbit. The *Saturday Review* critic is for a wonder nearly right as regards this word: it seems not to be in his nature to be quite right.

XUM

A rabbit is called a "Molly Cotton-tail" in Virginia; but not in Virginia only. The word is used in both the Carolinas and in Georgia. It has now spread westward, and I have heard it used in Missouri.

Gum. This word supplies the absurdest of my critic's mistakes, except only the next, which I have preserved as a *bonne bouche*. "Gum is," he says, "the Philadelphian's extension of the word 'gum' to include all manufactures of india-rubber, and especially overshoes." *Indeed!* Bartlett tells us all about "gums" for overshoes; and the very story which my critic gives in illustration, as a new one, was told me at the Century Club, New York, in December 1873 (ah! pleasant evenings at the Century, if I ought not rather to say pleasant nights—veritable *noctes Ambrosianæ*); and then it was told as an old one, and not by any means Philadelphian, or even Pennsylvanian, but American, *pur sang*. The story is good, however. A man arriving on a muddy night at the house of a friend (an untravelled city man of New York), was asked where his wife was. He replied, "She's wiping her gums on the mat." I heard the word "gum" thus used only a day or two since by an American step-daughter of mine, here in Missouri. As a matter of curiosity, I have asked my father-in-law what he knows of the use of this word in "old Virginny." He says that half a century ago, at least, everything made of india-rubber was called a "gum" there, without any other name except when doubt might arise. Thus a lady, when speaking of fastening a veil, would speak of the elastic as simply the "gum," otherwise as the "gum elastic"; a rubber ball would be a "gum ball," but a boy at ball-play would say, "Throw the 'gum,'" or "Catch the 'gum.'" The word "gum" used alone would generally mean the same as "rubber," that is, an india-rubber overshoe—our golosh. Everyone here in Missouri, and I believe throughout the States, would so understand "gum" and "gums." The word belongs about as much to Philadelphia as "Bantam" to Bradford. As to novelty, the expression probably is quite a new one—to my critic.

I may note in this connection (as Americans say, oftener than English folk) that if white men cut down words—as in this case, from "india-rubber overshoes" to "rubbers" or to "gums"—coloured folk are just as apt to reverse the process. Thus gum, and rubber, and india-rubber are combined into the odd word *Gunjer-rubber*! Elastic becomes *rubber-lastic*. We find even the monstrosities *Gunjerlastic* and *Gunjer-rubber-lastic!*

Use. My careful critic has discovered an example of recent and temporary American slang in the case of this word. "Just now," he sagely writes, "a New Yorker expressing his disapproval of a person or a thing, will tell you that 'he has no use for it.'" If the *Saturday Reviewer* had written fifty columns he could not more thoroughly have exposed his ignorance. He had written impudently enough that he had been moved to explain certain terms "in the hope that Mr. Proctor may be encouraged to learn something about the subject before he presumes to teach." *Mutato nomine de te*, my critic, *Fabula narratur*. Will English readers believe that this expression, which the ignorant *Saturday Reviewer* imagines to be "just now" coming into use "in New York," has been in use certainly half a century in nearly every part of the United States? It was one of the first expressions which attracted my attention in 1873 in New York and Boston; my wife, a Missourian by birth, recalls it from her earliest childhood; my father-in-law remembers it as familiarly in use when he was a child in Virginia; and a score of persons to whom I have related this excellent *Saturday Review* joke, attest the use of the expression throughout America—some of them referring it back *over sixty years!*

An associated use of the word may be mentioned as rather quaint; it is probably quite as old as the other, though my own recognition of it does not date back more than a dozen years. An American will speak of a person as too absurd, or too ordinary, or too homely *for any use*! For example, I should be correctly applying this Americanism in saying, "My critic is too ignorant, or too spiteful, 'for any use.'"

I may add, in conclusion, that although the *Saturday Reviewer* chances—strangely enough—to repeat a truth when he says that Charles Reade and Anthony Trollope failed lamentably with their American talk, he is altogether mistaken—naturally enough—in comparing the mistake with that of one who should mix Cockney, Yorkshire, Irish, and Scotch, and use it for English. American provincialisms are nothing like so marked as this comparison would suggest: moreover, Americans travel about so much, and many of them are so quick at appropriating oddities of expression, that even the curiously mixed talk of Joshua Fullalove, and the less obtrusively bad American of the senator, are not really so bad as they seem. They are bad enough though. Yet this does not much matter, any more than the very bad Irish of Thackeray's Costigan affects our enjoyment of "Pendennis." As an example of utterly incorrect dialect—equally harmless, however—I might mention Mr. Grant Allen's West Indian negro talk, which is an odd mixture of true West Indian dialect and such expressions as are met with among the coloured people of the States.

ARE SUN-SPOTS HOLLOWS?

THE evidence adduced by Dr. Wilson and subsequently confirmed by Sir W. Herschel, to show that sun-spots are saucer-shaped or funnel-shaped depressions, has been seriously questioned by many careful observers of the sun. The latest to express doubts on the subject is that zealous sun-observer (I had almost said sun-worshipper) the Rev. F. Howlett, some of whose admirable pictures of sun-spots we were allowed three years or so ago to reproduce in Knowledge. He writes, in the somewhat sepulchral pages of the Astronomical Society's "Monthly Notices," as follows:—

"I am desirous of placing on record some definite statements and measurements in connection with the appearance of certain symmetrically-shaped solar spots, both when near the centre and also when close to the limb of the sun. It will be found that these measurements entirely militate against the commonly received opinion that the spots are to any such extent sunk in the solar surface as to produce always those effects of perspective foreshortening of the inner side of the penumbra (when near the limb) which have been described in various works on astronomy.

"In my contention that by no means the majority of spots present that funnel-like appearance attributed to them by the Wilson hypothesis, I am sufficiently borne out both by Father Perry and Mr. Ranyard. The former, after paying especial attention, at my request, to this point in connection with a large and unusually symmetrical spot which was close to the western limb on the afternoon of April 12 of this present year, wrote me thus:—'The question of the foreshortening was specially attended to, and the observation showed a very slight excess of foreshortening on the side of the penumbra nearest the sun's centre, but certainly not enough to give any support to Wilson's theory.' Mr. Ranyard, again, in a letter of the 7th inst., reports:—

'I had a good look at your spot on the morning of Wednesday, June 2, and I again had a search for it on the morning of June 4' (when, I may observe, it had quite passed off the limb). 'I quite agree with you,' he says, 'that there was no appreciable difference in the breadth of the penumbra on the preceding and following sides of the nucleus' (umbra is here meant) 'when I observed it on the morning of Wednesday, June 2. I was observing it between 9h. 20m. and 10h. A.M., and I thought that the penumbra was a little *darker* on the preceding than on the following side, but not very noticeably so. There was no band of increased darkness such as would have been produced by a column of absorbing matter rising vertically above the nucleus. I quite agree with you that the phenomena observed did not tend to support Wilson's hypothesis.'

"With respect to this last spot, Father Perry's observations do not confirm my own to the same extent, apparently, as was the case in connection with the spot γ of April last, though it is on that of June 2 that I would rely, if possible, more firmly than on the rest. Together with some small but beautifully executed copies of the sketches of spots made recently at Stonyhurst, Father Perry wrote as follows:—'You will notice that near the edge there appears to be a slight confirmation of Wilson's theory at both limbs of the sun.' And he adds, 'In some of our drawings of solar spots this is much more marked; but these probably are different classes of spots, and all certainly do not behave alike.'

"But now as to actual *measurements* of what I would term the crucial spots γ of April 12, and λ of June 2.

"I first noticed γ on April 2, at 7h. 30m. A.M., when it was about 2′ 48″ from the eastern limb, and perceiving that the umbra was nicely central, and the whole spot neatly oval, I resolved to keep the spot under observation, with the view of testing the hypothesis in question. It was then about 50″ in length from north to south, and, as then, foreshortened on the sphere, about 40″ in breadth from east to west. On April 6 the size of the spot was somewhat diminished, but its neatness and suitability for testing the hypothesis was still more apparent, for a more perfectly central umbra or symmetrical penumbra could not be wished for. The spot 10h. 20m. A.M. that day was not far from the centre of the disc, and subtended about 45″ in length and the same in breadth.* When at length, on April 12, the spot had arrived very near to the western limb, I made the following notes:—At 4h. 20m. γ was only about 10″ from the western edge of the sun, and subtended not more than 10″ in breadth. The umbra still appeared quite central, with a width of not more than 2″. Each side of the penumbra measured also about 2″ in breadth, or possibly the 'preceding,' or outer, side, 2″, and the 'following' 1″·8, but of this I could not be quite certain.

"I may observe also, in passing, that on May 9 a spot lettered ι, when about 18″ only from the western limb, and measuring 40″ in length and 8″ in breadth, presented a perfectly central umbra 3″ in width; here again militating against Dr. Wilson's hypothesis.

"But now for the spot λ of June 2, 1886. This was also a remarkably symmetrical one, of a large size, and specially adapted to the investigation in hand. On June 1 the spot was, at 5h. 30m. P.M., just one minute from the western limb, yet there was not the slightest appearance of any foreshortening of the *inner* side of the penumbra. In fact, if there was a difference, the advantage was by about 1″ or so on the *inner* side. The spot now subtended about 45″ in length, by about 17″ in breadth.

"On June 2 (the day on which I had invited Mr. Ranyard, and also again Mr. Perry, to specially watch for Wilson's phenomenon) I made these notes:—At 7h. 50m. A.M. the outer border of the penumbra of the spot λ was just 20″ from the western limb. The whole spot subtended 45″ in length of heliographical latitude, but so foreshortened in directions of longitude as to subtend not more than 10″ in width.

"The *umbra* was as nearly as possible central, and having an apparent width of 3″. Both the preceding and following sides of the penumbra were of the same width, viz. 3″, though if there were a difference, the 'following,' or *inner*, side was the wider of the two, by perhaps 0″·5. There was at least a *sensible* difference (though exceedingly small, truly) in the opinion both of myself and a perfectly impartial fellow-observer, who, in fact, did not know what was expected one way or the other.

"I regret that there should have been any divergence of opinion between Father Perry on the one side and Mr. Ranyard and myself on the other, though that divergence is evidently extremely slight. What we require, however, in such investigations are actual measurements by micrometrical appliances."

In my treatise on the "Sun" observations of a kindred nature by several observers are mentioned, the earliest probably being Sir W. Herschel's observation of a spot in 1783, of which he remarks:—"I observed that, contrary to what usually happens, the margin of that side of the spot which was farthest from the limb was the broadest." Nothing, perhaps, can be regarded as much better established, or by a more widely ranging series of observations, than the fact that sun-spots do not systematically, even if regular in outline, present the signs of a funnel-shaped form which Dr. Wilson recognised in 1769, and the elder Herschel in 1779. The latest statements, before Mr. Howlett's, on this point are those addressed by Professor Spörer, of Munich, to an assembly of astronomers at Geneva in August 1885. He there, "in a copious *résumé* of his labours in connection with the solar spots" (I quote from Mr. Howlett's paper), "denies that the spots possess the character of funnels (*tonnoirs*), which is attributed to them in the greater number of works on elementary astronomy. The appearances which attend the disappearance of spots on the sun's western limb cannot, he affirms, be explained by such a theory. 'When a spot,' he says, 'is very shortly about to disappear, by virtue of the sun's rotation on his axis, the two *lateral* borders of the penumbra vanish from sight, whilst the nucleus [umbra] remains visible, together with the fragments of the surroundings (*pourtour*) to the north and south; the whole phenomena,' he says, 'presenting the appearance of a veiled brightness (*éclat voilé*) to such a degree that one might easily confound the nucleus [umbra] itself with its surroundings,' and of which typical and striking instances may be seen in vol. ii., sheet 99, and still more sheet 108, of my drawings. He seeks to explain this appearance by a heated facular border surrounding the spot, and causing an ascending current of extremely heated gas, through which it is with the greater difficulty that the spot is discerned, the nearer it is to the limb."

Mr. Howlett mentions, among possible solutions of the difficulty, the possibility that the refractive action of the sun's atmosphere, by which somewhat more than half his sphere should be visible to us, may be in question. He overlooks here the circumstance that small well-defined spots have been observed to appear on the eastern limb, and disappear at the western, at epochs by no means agreeing with the supposition of a refractive action outside the photosphere sufficient to show appreciably more than half the solar globe. Nor could prominences be flattened or levelled

* It is most unfortunate that Mr. Howlett did not measure, or at any rate does not mention, the breadth of the penumbra—that is, in effect, the size of the umbra.

XUM

as he suggests, at least in recognisable degree. In fact, their appearance and changes of appearance suffice entirely to negative this view.

I have long seen reason to believe that the explanation of the peculiarities of appearance observed when a spot is near the sun's edge (or "limb," as astronomers call it, comparing it not very reasonably with the limb of a sextant or quadrant) is to be found in the refractive action of the vapours occupying the depression which the sun-spot really forms beneath the level of the photosphere.

In the following figures (from my "Sun") I illustrate what is observed, as well as what ought to be observed, under different assumptions:—Fig. 1 shows in the upper

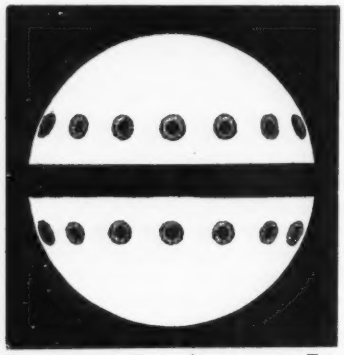


Fig. 1.—Spots on the Sun—Actual and Theoretical Changes.

row the changes recognised by Dr. Wilson; in the lower row the features which would be seen if the spots were surface stains with umbra and penumbra symmetrical.

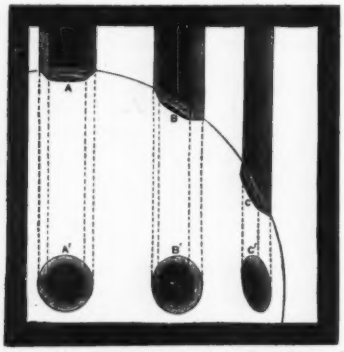


Fig. 2.—Wilson's Explanation of Sun-Spot Changes.

Fig. 2 illustrates the explanation of Wilson's observations commonly advanced, and first suggested by himself. Fig. 3 illustrates the feasibility, so far as Wilson's observations are concerned, of Kirchhoff's explanation, according to which spots are produced by the absorptive action of clouds floating above the surface of the sun.

For my own part I cannot understand how any one who has observed the general phenomena of sun-spots, and especially the peculiarities of appearance they present when near the middle of the disc, can doubt for a moment that they are, or rather indicate, depressions below the surface. There are at least a dozen better reasons for so regarding them in the phenomena of sun-spots, as seen near the middle of the disc, than in the doubtful effects of foreshortening of spots near the disc's edge. Moreover, the phenomena observed under the former and more favourable conditions would suffice of themselves to render a very fair account of the peculiarities observed under the latter conditions, manifestly unfavourable for deducing exact information.

I regard the problem to be explained as in reality this:—

Since the sun-spots manifestly show themselves to be depressions, when observed near the middle of the disc, why do they not always present the appearance due to that form when near the edge? Why in particular should the penumbra on *both* sides of a spot's shortest diameter when

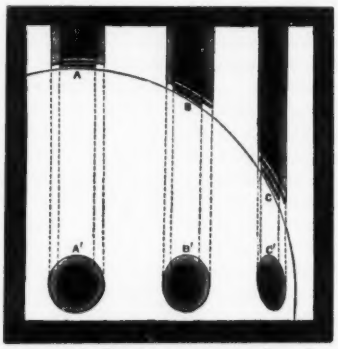


Fig. 3.—Kirchhoff's Explanation of Sun-Spot Changes.

near the edge be (or *seem*) often much narrower than we should expect it to be?

When we take into account the refractive action of the vapours within the saucer-shaped depression of a symmetrical spot, we find a sufficient explanation.

Suppose, for instance, that we have in fig. 4 a rough representation of the section of a spot, when, as yet, the action, whatever it may be (eruptive in my opinion), to which the opening is due, is in its early stage, so that the regularity of the spot is as yet unbroken. The figure shows between SPP′S′ and *a* UU′ *b* the streams of ascending glowing vapour, partly condensed into cloud form, which, vertical where there is little disturbance, form the so-called rice grains. We see them near the spot-opening thrust sideways, so as to be packed near their tops into the great facular masses seen around a spot. The expansive action of the vapour within the spot region, carried as it has

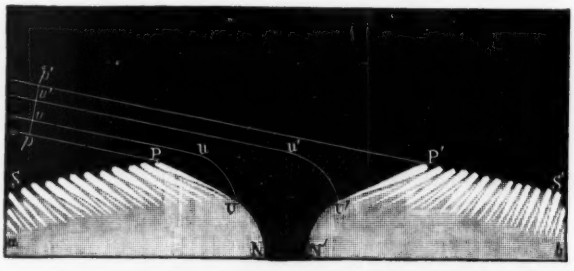


Fig. 4.

been from regions of greater pressure deep down below, leads to a cooling (relative only, of course), by which the vapours acquire the absorptive power indicated by the darkening of the spot region. We see also why, looking vertically down into the spot, the central part appears the darkest, for though in looking at the nucleus we are looking towards NN′, where the vapour is hotter than at UU′, and in looking at the umbra we are looking towards UU′, where the vapour is hotter than at PP′, which marks the outer limits of the penumbra, yet we have a greater range of absorptive vapours in the first case than in the second, and in the second case than in the third. Probably, also,

the region of vertical clouds of condensation, whose upper surface is the photosphere, while its lower surface marks the inside limit of the penumbra, is intrinsically brighter and hotter (because of the heat liberated in condensation) than the region of vaporous matter in which the clouds form, and above which they are suspended. Now the vaporous region NUPP′U′N′ must possess considerable refractive power, since it is dense enough to produce great absorption. Hence we are not only justified in expecting, but compelled to take into account a measurable deflection of the lines of sight by which the various parts of the interior of a spot are seen, when the spot is near the edge of the solar disc, and so viewed aslant.

Suppose now *p*P and *p*′P′ to be the lines of sight, not appreciably deflected, to the outer edges of the penumbra, P being the edge nearest the centre of the disc, P′ the edge nearest the limb. Not taking deflection into account, we see that the penumbral face PU would be absolutely invisible, while the face P′U′ would occupy nearly the whole breadth, *pp*′, of the range of view. But the lines of sight *u*u and *u*′u′, being similarly curved by refraction from u and u′ to U and U′ respectively, the penumbral face PU will manifestly be brought into view, while the penumbral face P′U′ will be narrowed. And it is easy to understand that since spots vary much in size and depth, and also presumably in the constitution of their vaporous contents, the amount of deflective action will be correspondingly variable, and therefore the varying effects of foreshortening, from that observed by Wilson down to apparent absence of foreshortening, can be readily explained—or rather are obviously to be expected.

We can see, further, that when the lines of sight to the spot are still more aslant than as shown in fig. 4, the deflective action may just fail to show PU at all, while it will so narrow the opposite face P′U′ that this face will also be lost—especially as it is looked at through a much greater range of absorptive vapour. This last point must also be considered in dealing with estimates of the two sides of the penumbra of a spot near the edge; for the darkening of a penumbral streak may very easily be mistaken for narrowing; in fact, from the known laws of irradiation this deceptive effect may be expected. It would even affect photographs, for photographic irradiation is as real and almost as sensible as the irradiation affecting the ordinary vision of bright objects.

SOME PUZZLES.

(*Continued from p. 337.*)

PROBLEM IV. *Let* ABA′B′ (*fig.* 1) *be an elliptical form,* P *the farm-house. We have to divide this farm into three equal farms, each having a perimeter equal to that of the undivided farm, and each also in free communication with the farm-house.*

THROUGH C, the centre of the ellipse, draw the diameter PCP′; and divide PCP′ into three equal parts in the points *p* and *p*′. On P*p*, P*p*′, describe the half ellipses P*bp* and P*bp*′, similar to the half ellipse PABP′, and similarly situated. On P′*p*′ and P′*p* describe the half ellipses P′*b*′*p*′ and P′*b*′*p*, similar to the half ellipse P′A′B′P, and similarly situated. Then the three spaces into which the ellipse is divided by these curved lines are equal to each other, have equal perimeters, and all obviously communicate with the farm P.

For the half ellipses on the left of PP′, taking them in order from P, have areas as 1, 4, 9, so that the portions of the farms on that side of PP′ have areas as 1, 3, 5. The corresponding portions on the other side of PP′ have areas as 5, 3, 1, Hence the farms have areas as 1+5, 3+3, and 5+1, or as 6, 6, 6.

The portions of perimeters on the left side of PP′ are as 1, 2, 3; the corresponding portions on the right side of PP′

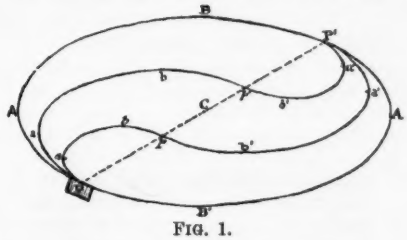


FIG. 1.

are as 3, 2, 1. Hence, taking the farms crossed by P*p*, *pp*′, and *p*P′ respectively, we see (on referring to the figure) that their perimeters are as—

(i) 1+2+3, (ii) 2+1+1+2, and (iii) 2+1+3;

or as 6, 6, 6; while the perimeter of the original farm is as 3+3, or also as 6.

It will be obvious that if any straight line be extended across the farms from P, and falling on the left side of PP′, it will be divided by the farm boundaries into three equal parts; and the like with any straight line extended across the farms from P′ and falling on the right side of PP′.

PROBLEM V. *To draw six circles cutting each other in eight points at an angle of* 60°.

The method is shown in fig. 2. The path to the solution was suggested when the problem was presented as an exercise in stereographic projection.

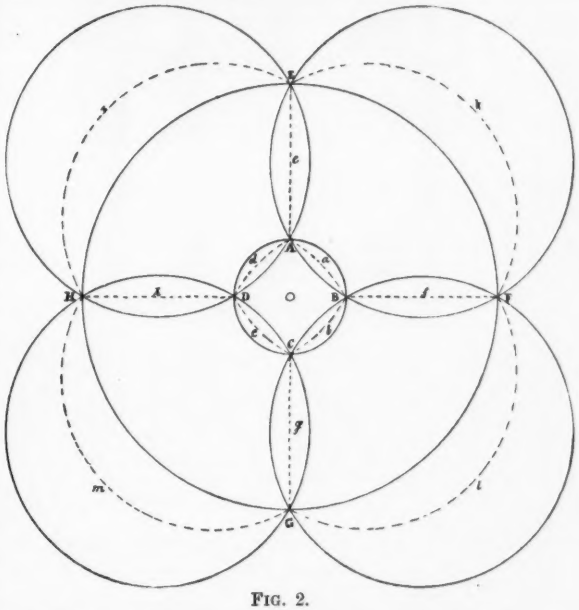


FIG. 2.

In fig. 2 the dotted lines represent stereographic projection of the six portions of a sphere corresponding to a circumscribing cube—the six maps, for instance, of the S.D.U.K. star atlas devised by De Morgan—the central point of one of them being the centre of projection. These are shown in dotted outline. The six circles are the stereo-

graphic projections of the circles circumscribing these six equal divisions of the sphere.

A little consideration will show that these circles intersect each other on the sphere, and therefore in the stereographic projection at angles of 60°. For the sides AaB, AdD, AeE meet at equal angles; each, therefore, 120°. Hence, AaB and AdD meet the circle ABCD at an angle of 30° (half of 180°—120°). They must in like manner (regarding them as representing sides of the spherical square EABF) meet the circle EABF at the same angle, 30°. Hence the circles ABCD and EABF cut each other at angles of 60°, and the like with all the other circles of the figure.

Note that the arcs AaB, GmH belong to one circle. The reason will be obvious to those familiar with the properties of the stereographic projection. For on the sphere the points A, G, lie at the extremities of a diameter, and B, H, at the extremities of another. So that the points ABGH necessarily lie on a great circle. Similarly with the arcs BbC, HnE, &c., &c.

Problem VI. *To draw twelve circles cutting each other in twenty points at an angle of* 60°.

The method is shown in fig. 3. The explanation is similar to that of Problem V. In fig. 3 the dotted lines represent the stereographic projection of the twelve portions

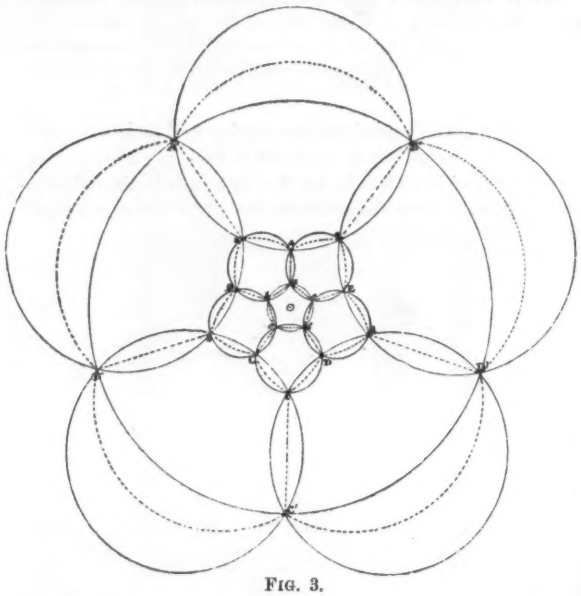


Fig. 3.

of a sphere corresponding to a circumscribing dodecahedron—the twelve maps, for instance, of my "Library Star Atlas" and "School Star Atlas," the central point of one face being the centre of projection. The twelve circles are the stereographic projections of the circles circumscribing these twelve equal divisions of the sphere. (In my atlas the twelve circles are the boundaries, so that the maps conveniently overlap.)

The dotted arcs *ab* and C′D′ form part of the same circle, as do the arcs AB, Dd, &c., &c., &c. For the points *a*,C′ are antipodal, as are *b*,D′ and a,D, &c., &c., &c., &c.

The problems for solution next month are these three :—

Problem VII. *To mark in a series of points on a card, by some simple geometrical construction, by joining which with straight lines a parabola may be pictured.*

Problem VIII. *The same for an elliptic.*

Problem IX. *The same for a hyperbola.*

(*To be continued.*)

THE SIXTY-FOUR SIXTY-FIVE PUZZLE.

IT appears that misprints in the description of my plan for improving the construction of the "64–65 square" puzzle rendered it unintelligible to many. The printers were not in fault, as this was the first occasion when any mathematical work has been done by them for Knowledge since the printing passed into their hands; and my plan of underlining single letters intended to be italic, seems to have been misunderstood in some cases as signifying small capitals.

I will now give a brief but better account of my method —which really makes the trick very much better than as usually presented :—

In fig. 1 we have the rectangle of 65 squares, 5 by 13. The diagonal Bb cuts the fifth line *fa* in *h* above *e*, the

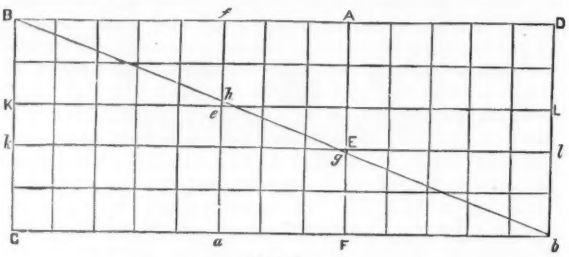


Fig. 1.

intersection of *fa* and KL; while it cuts AF in *g* below E, the intersection of FA and *kl*. In fitting the four pieces BgA, AD*bg*, *hab*, and Bg*ah*, together, this defect may attract attention. If, instead, we divide up the square of 64 squares, a corresponding defect will arise which a keen eye will also readily detect.

Let us see what the discrepancy really amounts to. Suppose the squares each 1 inch in the side. Then *fe* is 2 inches; and since *fh* : D*b* : : B*f* : BD, we see that $fh = \frac{5}{13}$ of 5 inches. Thus $eh = 2 \text{ in.} - \frac{25}{13} \text{ in.} = \frac{1}{13} \text{ inch} = Eg$.

To prevent a keen-eyed person from detecting, as he might, this 13th of an inch, halve it between the two arrangements. Instead of drawing B*b* as in one method (where the rectangle is cut up), or B*e* and *eb* as in the other (where the square is cut up), draw a line from B to a point midway between *h* and *e*, and from this same point carry on a line to *b*. In like manner, draw from *b* a straight line to a point midway between *g* and E, and from this same point carry on a line to B. Cut along these lines, by which you cut out a long parallelogram, having B*b* as a diagonal, and equal in area to half one of the 65 squares. This is thrown away. Thus practically, in presenting the problem this way, you put together areas equal to $64\frac{1}{2}$ squares, in such ways that they may be supposed either to make up 64 squares or 65 squares; whereas, on the usual plan, you either have to convince folk that 64 squares are 65, or that 65 squares are 64.

But on this plan, as on the other, you still fail to have true corners for the squares around *e* and E. Now this peculiarity of shape is more easily detected than the errors of length and area which affect the drawing. To get rid of it, the lines *fa* and KL must be altered. My plan for this, which makes the puzzle as nearly perfect as it can be, may best be illustrated as follows :—

Let *hem*, fig. 2, be an enlarged view of the small triangle which has *he* for a side in fig. 1. Let *p* be the middle point of *he*, and let *pq* be part of the cutting line to *b* on the plan described. Then *peq* is the triangle whose absence from the small square having *e* as its lower left-hand corner

is liable to attract attention. On *pq* take a point *o* nearer to *p* than to *q*, and instead of the lines KeL and *fea*, join this point *o* with the points *f*, *a*, K, and L. The error in the drawing will not be noticeable, and on fitting the four pieces together all the spaces around *e* will be four-cornered, and will seem to be squares. In like manner, with the other triangle having Eg as a side. Representing this on an enlarged scale, as in fig. 3 by E*gn*, and letting *r* be the middle point of Eg, and *rs* a part of the line from *r* to B

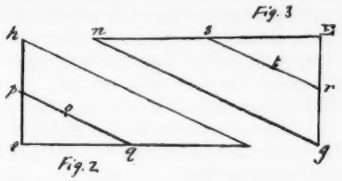


Fig. 3

in fig. 1, we take *t* on *rs* as a point to be connected with A, F, *k*, and *l*.

The point *o* should divide *pq*, so that *po* : *oq* :: *fe* to Ke (fig. 1), or :: 5 : 2. For then the deviations of the lines from *f* and K will be best distributed to escape attention. But *f* may be slightly shifted towards A, and K towards B, *a* towards *b*, and L towards D (still more slightly), to help the illusion. Corresponding remarks apply to the point *t* and lines from it.

When such precautions are taken the rectangle BD*b*C may be drawn very accurately, and all on a large scale, while the pieces may be left for thorough inspection and repeated adjustment without any chance of the trick being detected, even by measurement. Of course, even a lad with geometrical proclivities will detect the trick by reasoning.

MINUTE WRITING.

A FRIENDLY rivalry in minute writing sprang up recently among various correspondents of the *Newcastle Weekly Chronicle*. Someone had written the Lord's Prayer (with the Doxology, as in all cases mentioned later) within a space which a threepenny piece will cover. Then others wrote it smaller. At last, one wrote it within the space covered by the end of an ordinary pencil. On hearing of this, remembering that, when a lad, I had been able to write rather small, I tried my hand, and managed to get the Prayer into a space just over the half of that which the end of a lead pencil will cover. Not to be beaten, one of the small-writing company wrote the Prayer just within the half of a pencil end, though, as the editor of the *Weekly Chronicle* announced, not quite so distinctly as I had written it in a somewhat larger space.

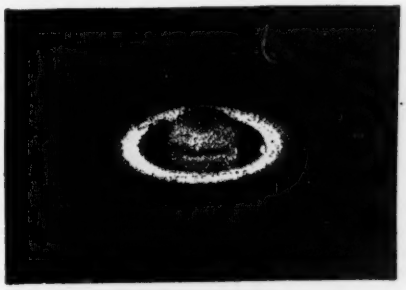
I then tried my hand again, having noticed that at each fresh trial I seemed to recover more of the skill I had formerly had in such small work. The result is thus described by my friend, the editor of the *Newcastle Weekly Chronicle*, who has been a sort of umpire or referee in this minute contest. (I trust no reader of Knowledge, after reading what follows, will assert that I have been making little of the Lord's Prayer.)

"Mr. Proctor, who is on a visit to Missouri, United States, has sent me three other specimens of his skill in microscopic writing. One of them is the Lord's Prayer written in less than a half-ring marked by a penholder smaller than an ordinary pencil-ring. Another is the same prayer occupying a space slightly over the half-ring. A few touches of the pen have given the latter specimen the appearance of the sun rising out of the sea. The third specimen is in some respects the most striking and curious of the three. It is the Lord's Prayer written three times over on three straight lines a shade over two and a half inches long. The writing in this case is so straight and minute that the three lines look to the naked eye like three ruled lines. And yet, when placed under a magnifying glass, every word is seen to be perfectly distinct. Mr. Proctor's feats are perhaps all the more remarkable since they were performed under trying circumstances—when he was, as he states, 'roasting at St. Joseph with the thermometer at 107° in the shade.'"

I expect some of the others will get ahead of this, and, if so, I shall try yet again, in more favourable weather than we have yet had in St. Joseph for work of this sort.

PHOTOGRAPH OF SATURN.

THE accompanying enlargement of a photograph of Saturn, by MM. Henry at Paris, like the photographs of star-fields in preceding numbers of Knowledge, has received no touch from the hand of any human engraver. It is Saturn's own work. In that sense it is full of promise. Next month we hope to introduce a photographic engraving of Jupiter, by Jupiter.



Saturn Self-Photographed.

FIFTEEN SCHOOL-GIRLS.

A CORRESPONDENT asks for a solution of the problem of the fifteen school-girls who—to avoid plots against the peace of the community (of which school-boys would naturally be innocent)—were to walk day after day in sets of three, in such a way that no two would be in the same set more than once in seven days. Solutions will be found in Volume II., and a discussion of the puzzle there and in Volume III. We will give the solution next month, when we may also consider the general principles involved in such puzzles.

There is a puzzle of the kind, by no means so easy as many might imagine, which is of frequent occurrence in a practical way:—

Given $2n$ chess players; how are they to be arranged in pairs so that there may be $(2n-1)$ sittings, each of n games, all the players being engaged at each sitting?

By beginning with an easy problem of pairs, problems relating to sets of three, four, and more may be readily dealt with.

XUM

Here is an example of the more difficult sort:—

There are sixteen whist players; how may they sit down to five different games so that no two may take part together (either as partners or adversaries) in more than one game?

Gossip.

By Richard A. Proctor.

A correspondent asks whether in my article on a "Dead World" the sentence beginning "Sulphurous acid might be as innocent as rose water," &c. (July number of Knowledge, p. 283), "does not imply that sulphurous acid and vitriol are the same substance"? I should be grieved to suppose so. Sulphurous acid and vitriol are distinct, but sulphuric acid may be obtained chemically from sulphurous acid, and as a matter of geological fact, sulphuric acid is nowhere found in nature free, except in the neighbourhood of volcanoes. It appears probable that this sulphuric acid, which is only found at active vents, is formed under such conditions as exist in such spots from the sulphurous acid which is more widely found. Or it may be liberated from sulphides of the metals. If we consider the occurrence of sulphuric acid in the rain falling in towns and manufacturing districts, we shall see reason to believe that during the times when the earth's volcanic activity was very much greater than now, vitriolic rain fell in considerable quantities.

* * *

As to the effect of rains in which sulphuric acid is present, we need only note that even the small quantities present in the rains of our time cause the corrosion of metallic surfaces, stones, mortar, and so forth. Angus Smith remarks that the mortar of walls may often be observed to be slowly swelling and dropping out, owing to the conversion of the lime into sulphate.

* * *

Probably, in the sentence referred to, I intended to write sulphuric acid; but sulphurous acid need not have been misunderstood, I think, since its presence implies conditions under which sulphuric acid would certainly be present also. Roth, "Chemical Geology," p. 452, remarks that sulphurous acid and sulphuretted hydrogen are sometimes oxidised into sulphuric acid, which remains free in the water of springs.

* * *

The same correspondent writes as follows on another subject:—

"If occasion should offer itself for making any further reference to Josephus's supposed testimony to Jesus Christ, I should be glad if you would say whether the passages referring to James the Just as the brother of Jesus, *who was called Christ*, are considered genuine or not. The following passage I have seen quoted, but have not succeeded in finding in the text: 'These miseries befell the Jews by way of revenge for James the Just, who was the brother of Jesus that was called Christ, on account that they had slain him, who was a most righteous person.'

"The stoning of James is related in 'Antiq.' book xx., ch. ix., and he is there referred to as 'the brother of Jesus, who was called Christ.' I have seen no reference to these passages in anything you have written about Josephus in Knowledge, and they have only recently come under my notice, otherwise I should have written to you about them before. Now, I fear, you will probably not care to reopen the subject again."

* * *

I know of no such passage as our correspondent quotes. It seems to me probably a quotation from memory (incomplete) of the passage relating to John the Baptist, where, however, Herod's defeat (not Jewish misery) was attributed by the interpolator to the murder (quite impossibly altered in details of place and time) of John, not of James. "Some of the Jews thought" Herod's defeat was "a punishment for what he did against John—who was a good man," &c. The stoning of "James, the brother of Jesus, who was called Christ," is mentioned in the "Antiquities," book xx., chap. ix., § 1. It is unfortunate that the interpolator, who came a little late to his work, after the absence of a single word in Josephus relating to Christ had been thoroughly recognised by Christian apologists, was not aware of the fact that the James referred to was certainly mentioned elsewhere as alive long after he was delivered to the sanhedrim by Ananus to be stoned. Whiston, indeed, would have us believe that the account as worded does not and cannot signify that James actually was stoned. But Josephus certainly would have told us if the sentence had not been carried out. On the contrary, he says that the most equitable of the citizens disliked what was done, and sent to King Agrippa desiring him to send to Ananus that he should do so no more. The interpolator of words by which the actual James was stoned by order of Ananus or Ananias was altered into another James, described as a brother of Jesus (in turn altered by theologians into a "cousin!"), should have added another line, explaining that James was restored to life.

* * *

I may take the opportunity afforded by my correspondent's request to note that, mysterious though the silence of Josephus may seem in regard to events described as having happened in the city of his birthplace, and a few years only before his birth, the silence of Philo is more mysterious still. He was about sixty years old, according to his own account (written about A.D. 40), at the reputed date of the Crucifixion. Unhappily, no follower of Eusebius (the first to quote the interpolated passage about Christ in Josephus) seems to have thought of applying that devout man's principle that "it is lawful to lie and cheat for the cause of Christianity" to the works of Philo the Jew. So that a Christian apologist of our own days, the Rev. Dr. Giles, in his "Hebrew and Christian Records," vol. ii., p. 61, is compelled to write in the following melancholy strain:—

> Great is our disappointment at finding nothing in the works of Philo about the Christians, their doctrines, or their sacred books. . . . His silence is the more remarkable, seeing that he was about sixty years old at the time of the Crucifixion, and, living mostly in Alexandria, so closely connected with Judæa and the Jews, could hardly have failed to know something of the wonderful events that had taken place in the city of Jerusalem,—

assuming always that those events had really taken place as described nearly a century later.

* * *

A scarcely less mysterious puzzle is the silence of Pliny the Elder, Seneca, Diogenes Laertius, Pausanias, Tacitus, Suetonius, Appian, Justin, Ælian, and others, who might have been expected to make some remarks about Christianity, had its beginnings been such as are commonly described.

* * *

Tacitus, of course, is credited with a reference to Christians, "malefactors called after Christus, who, in the reign of Tiberius, was put to death as a criminal by the procurator Pontius Pilate." Unfortunately this passage is not referred to by *any* of the Christian fathers, though several of them were readers of Tacitus, and some of them had specially searched his works for just such support as the passage would have supplied. Thus, Tertullian, who died about A.D. 220, much needed such evidence (see his 'Apolog.' ch. 5); but with all his study of Tacitus (not a very voluminous writer), he knew of no passage relating to the Christians in Tacitus's time (say A.D. 55 to A.D. 117). Neither did

Clement of Alexandria, who had set himself the task of hunting out all such references. Not even Eusebius had found this passage; nor had he (in face of the fact that the MSS. of his day had been notoriously searched in vain for such a passage) the courage to invent it. Yet he wanted not that sort of courage by any means. Justin Martyr, in A.D. 141, addressing the Roman people, the senate, and the emperor in defence of Christianity, could adduce no such evidence; yet if he could it would have been worth a hundred such arguments as he used (though that, perhaps, is not saying much). "As to the objections," he writes, "about our Jesus being crucified, I say,"—*not* "your own Tacitus says he was crucified, and by Pilate, even as our historians say," but simply and most feebly—"suffering was common to all *your* sons of Jupiter, so why should not *our* son of Jupiter suffer"? There is, in fact, no trace of the passage before the fifteenth century. The very use of the word "Christ," as if it were a name, like the incorrect use of "Buddha" for "the Buddha," shows that the passage is an interpolation by some ignorant person, who certainly carried out his pious fraud at least 300 years after the time of Tacitus, and probably much later even than that. The Romans were not intolerant in religious matters; and most probably the malefactors referred to in the passage as it originally stood were really evil men—not Christians at all, even in name.

* * *

The following jest ought to be good, seeing that it was made nearly a year ago in the *Saturday Review*, and is now repeated for my special benefit and delectation, as something too fine to be forgotten, in the sweetly honest critique of my "Americanisms," on which I have touched elsewhere in this number. My critic, by the way, expresses astonishment that I "have not hesitated to reprint the jibe of an enemy" about "*le savoir c'est moi*"—see Gossip for May, p. 228. So like a *Saturday Reviewer* to regard a jibe as the work of an enemy! My critic's astonishment at my repeating the joke is as characteristic of him as—I trust—my own action is of me. Anything like frankness, or fairness, or a sense of fun for its own sake, must seem so strange to a man like my critic. I doubt very much whether the man who made the neat joke about *le savoir c'est moi* meant to hurt me. There was too much good fun in the joke for that. Any way I hold, now as always, that a joke about myself is as well worth repeating as another, if good as a joke, whether it is a sooth jest or not. There is much less fun in the laboured joke—smelling of the dictionary—elaborated by my *Saturday Review* critic, who in assuming that a jibe must come from an enemy, writes himself down one—where I write him down rather a false friend.

* * *

"We suggested to Mr. Proctor the cultivation of a marine mongoose to kill off the sea serpents which seem to inhabit the seven-leagued boots with which he strides across three continents disseminating very popular science." Country and colonial papers please copy, for the *Saturday Review* regards this as a superior joke! I commend it specially to Mr. Grant Allen, whose proposition in the *Cornhill Magazine* about a year ago, that a sea serpent should be put into one of our museums, seems to mark the incubation of this very funny suggestion. I ventured a smile at that embryonic jest, as I now venture to laugh at it in its full-grown form.

* * *

I would not, however, advise my critic, or any of his readers, to imagine that *very* popular science will suffice to make tri-continental lecturing successful. I fancy I remember cases in which "very popular" science-mongers have been very great failures on the platform. My own plan is to suppose my audiences very critical—Darwins, Tyndalls, and Huxleys, come to hear a subject about which they have no special or technical knowledge—and beyond the omission of technicalities I do not know that my lectures can be properly called popular. I would recommend my critic, if he would attain better success on the lecture platform than has yet rewarded his exertions, to try the following mixture:—First, long and loving study of some subject; secondly, real enthusiasm for it; and thirdly (what I am told some lecturers lamentably want), respect for his audience.

* * *

The mongoose, in this "jibe of an enemy" (I thank thee, friend, for teaching me the word), reminds me of a mongoose story, which I have heard in various forms, and now repeat (throwing in Americanisms) as it was told me by a charming fellow-passenger—an American lady—on the *Germanic* a few weeks ago. (It will bear repeating, though probably many of my readers have already heard it):—

A "down-east Yankee" sat in a street-car opposite a quiet-looking man who carried a bag. Overcome at length by innate inquisitiveness, the Yankee asked—

Yankee: "Say, stranger, what air you carrying in thet ther bag?"

Stranger: "Ssh—sh! Don't tell! A *mongoose*!"

Yankee: "I *want* to know! But—say stranger—*what's* a mongoose?"

Stranger: "A mongoose is a *Macauco*, or *Maki—genus Lemuridæ*. It kills snakes."

Yankee: "Du *tell*! But—say stranger—what snakes are you going to kill with this yer—this yer—mucky—mongoose?"

Stranger (*solemnly*): "I have a brother. He sees snakes! I'm taking along this mongoose to kill those snakes!"

Yankee: "Sakes *alive*! But—say stranger—them snakes ain't real!"

Stranger (*descending sadly from the car*): "I know it. But then—you see—this mongoose isn't real either." *Exit.*

Yankee (*reflectively*): Wal! Darn my *mother*!!"

* * *

"The bearings of this" fable "lays" (as, alas! too many Americans say) "in the application on it." The *Saturday Review* criticism is the mysterious bag. Any one who expects to get truth out of such a *critique* may be aptly compared to the unwise Yankee; the mongoose is my critic's wisdom; my critic is the demented brother; and the snakes seen by the crazy brother are the faults my critic notes in my "Americanisms." I show elsewhere that the faults "ain't real"; "but then—you see"—my critic's wisdom "ain't real" either.

* * *

A correspondent asks whether the surgical operations, on which the interest of Mr. Grant Allen's shilling shocking "Kalee's Shrine" chiefly turns, are possible: whether the eyelids can be permanently prevented from working by cutting two nerves, or put into working order again by cutting two more. I cannot imagine how the former operation could be effective for more than a few days, or how, if the former were possible, the latter could be effective at all. It would seem about as likely that if an *extensor* muscle were cut through, and then the corresponding *flexor* were also cut through, the person experimented on would be just as well off as if he had not been touched. But I would not venture an opinion on a subject outside my range, lest haply some *Saturday Review* critic should accuse me of writing "with delightful self-satisfaction" about matters whereof I know nothing. Mr. Allen introduces so many surgical matters into his stories that I make no doubt he has studied surgery very thoroughly indeed.

XUM

I wonder what my good friend Mr. Browning, whose excellent little treatise on the eye has just, I see, received high and well-deserved praise in *Truth*, would say about the "Kalee" eye story. The only ophthalmic story I care to speak about myself, just now, is that old one which relates how a critic was told to cast a beam out of his own eye that he might see more clearly to remove a mote from another's.

The *Times* of August 16 gives the prominence of leaded type to a puff of Mr. Romanes's paper on "Physiological Selection" read before the Linnean Society in May last, in which a theory is presented in explanation of the problem of the sterility of species at a certain stage in the evolution of varieties. Mr. Romanes finds the key in the subtle action of variation on the reproductive system, but his theory has the not slight defect of being as yet unsupported by facts; these, however, he proposes to collect by systematic observation of many species.

* * *

Mr. Romanes's friend claims him as the Elisha on whom Mr. Darwin's mantle "has most conspicuously descended." Now, we are not sure that Mr. Romanes has Mr. Darwin's mantle, but we are sure that he has neither his modesty nor his method. His paper is a vicious example of self-laudation, with covert inferences that Mr. Darwin's fact-proven theory is related to his factless theory in the sense that the imperfect covenant of the Old Testament is related to the perfect covenant of the New. So anxious is he, representative of this age of scramble after notoriety, to get to the fore, that he has no thought of copying the patience of the great master who sifted mountains of fact before announcing his memorable explanation of the mutability of species. And, in the absence of the yet uncollected facts to prove not that Physiological Selection *must be*, but *is*, the *Times* writer makes the damaging admission—not surprising to those who know Mr. Romanes's unstable equilibrium in matters theological—that his theory is "quite capable of being reconciled with some views of special creation."

* * *

The *Times* of September 2 refers to the theory as causing "excitement" among biologists, but it appears to have been practically dismissed at the British Association meeting. Mr. F. Darwin's references to the "Origin of Species" in *Nature* of September 2 show that the originality claimed by Mr. Romanes is baseless, and the theory has received its *coup de grace* at the hands of the highest living authority on the subject, Mr. A. R. Wallace, in the September number of the *Fortnightly Review*.

* * *

He alone may claim equality with Darwin who solves the great *crux*—the causes and conditions of variations.

The papers on "The Unknowable" may be regarded as closing, so far as their serial form is concerned, with the present number.

* * *

We propose to begin with the November number (the first of Volume X.) a series of maps of the whole earth, on one scale—the first such series ever produced, to the best of our knowledge, in which the whole earth has been shown on a uniform plan, to one scale, and almost without distortion. The series will, we believe, be very useful for students of history and travel, as well as for students of geography, for whom it is specially intended.

* * *

We have by no means forgotten our promise to bring out a series of star maps showing the southern skies, month by month, as we have already shown the northern skies, in "The Stars in their Seasons," and more simply in "The Star Primer." The engravers to whom our first maps were entrusted seemed to find pleasure in thwarting our plans by delays and blunders. We found also some complaints arising because the maps were late for the southern hemisphere. We propose, therefore, to make a fresh start on a new plan, with the engravers who now carry out our wishes.

* * *

We would invite the special attention of whist-players to the "Whist as Taught by Mathews," which we propose to begin with our November number. Mathews may be regarded as of all writers on whist the one by whom whist *strategy* has been most intelligently and originally dealt with.

Reviews.

Elements of the Comparative Anatomy of Vertebrates. Adapted from the German of Prof. Wiedersheim. By W. Newton Parker. (Macmillan.)—This work may be regarded as an admirable supplement to Gegenbaur's "Elements of Comparative Anatomy," which the same publishers issued a few years ago under the editorial care of Prof. Ray Lankester. A distinguishing feature of the book is the number and completeness of the illustrations, especially those showing the circulatory systems, which are printed in different colours. The arrangement of the chapters according to organs, instead of according to groups of animals, assumes a general acquaintance with biology on the part of the student; but as emphasising the fact of an evolution of organs as well as of animals, such arrangement is of the first importance. As the translator, while retaining the plan of the original, has made numerous additions to and modifications in the work, rendered necessary to bring it up to time, we had hoped to have found more detailed reference to the origin and genealogy of the monotremes, whose place in descent is referred to elsewhere in these columns. But we tender Prof. Newton Parker ungrudging thanks for the good and valuable service rendered in making Wiedersheim's book accessible to English students.

The Elementary Principles of Electric Lighting. By Alan A. Campbell Swinton. (London: Crosby Lockwood & Co. 1886.)—This little book may be heartily recommended to all who wish to understand the principles of electric lighting without entering into the mass of technical and mathematical detail which usually encumbers works on the subject of which it treats. Clearly written and well illustrated, it contains a thoroughly intelligible explanation of the whole matter within the limits of twenty-nine pages.

A Practical Manual of Wood Engraving. By Wm. Norman Brown. (London: Crosby Lockwood & Co. 1886.)—Here is another capital work for the incipient learner. Mr. Brown presupposes no previous knowledge whatever on the part of the student, but begins at the very beginning. After a brief historical introduction, he describes every tool which the pupil will require, and the mode of its use, following this up, with examples and "copies" for him to practise. The book is fully illustrated.

Photo-Micrography. By I. H. Jennings. (London: Piper & Carter. 1886.)—The microscopist who may wish to obtain absolutely trustworthy delineations of objects and structure revealed by his instrument is now no longer confined to the difficult and uncertain use of the camera lucida and the lead pencil for this purpose, but finds in the

resources of modern photographic art all that is needful for his purpose. Mr. Jennings's *brochure* will be found handy by all who are entering on this fascinating pursuit, as he describes instruments, processes, and objects in considerable detail. Dr. Maddox contributes a chapter on preparing bacteria. Illustrations from photographs, as also from ordinary wood blocks, appear wherever they are required to elucidate the text.

Partiality in Unity; or, A View of the Universe. By "ONE OF ITS PARTS." (London: Wyman & Sons. 1886.)—The author of this work, brooding over the mystery which has puzzled wiser heads than his own, supposes himself to wander forth on a summer night and hold converse with a "stranger." This conversation is carried on throughout in blank verse, at the end of 1,400 lines of which the "Mortal"—or author—arrives at the original conclusion that "Humility alone is peace." His end thus being peace, it only remains to remark that neither mortal nor immortal seemingly possesses the most rudimentary idea of scanning.

Algebra for the use of Schools and Colleges. By WM. THOMSON, M.A., B.Sc., &c. (London: Sampson Low, Marston, Searle, & Rivington. Cape Town: J. C. Juta & Co. 1886.) *The Elements of Plane Geometry.* Part II. (corresponding to Euclid, Books III., IV., V., VI.) (London: Swan Sonnenschein, Lowrey, & Co. 1886.) *Arithmetical Exercises.* By F. C. HORTON, B.A. (London: Seeley & Co. 1886.)—Of making many (school) books there is seemingly no end. Our table is rarely free from them, and "the cry is still 'They come!'" Of the three whose titles head this notice, Mr. Thomson's *Algebra* may be commended for its thoroughness. It seems somewhat too abstract in places for the incipient learner, but as it is intended for colleges—and is, in fact, the text-book at the University of the Cape of Good Hope—it is not difficult to see on what ground this might be defended. The second work on our list is prepared by the Committee of the Association for the Improvement of Geometrical Teaching. With reference to it we may remark that while some of the theorems are simplifications of those of Euclid, and a few of the proofs distinguished by a certain amount of neatness, in other cases we fail to see any improvement whatever on the demonstrations contained in the immortal work of the mighty Alexandrian geometer. Mr. Horton's examples seem judiciously selected.

THE FACE OF THE SKY FOR OCTOBER.

BY F.R.A.S.

THE sun may be looked at on clear days for the spots and faculæ which from time to time appear in diminishing size and numbers on his face. The Zodiacal light is now visible in the East before sunrise. The night sky is delineated in map x. of "The Stars in their Seasons." Minima of the variable star Algol ("The Stars in their Seasons," map xii.) will occur on the 1st, thirty-one minutes after midnight; on the 4th at 9h. 20m. P.M.; on the 7th at 6h. 9m. P.M.; on the 24th at 11h. 3m. P.M.; and on the 27th at 7h. 52m. P.M., other minima happening at very inconvenient hours. Mercury is an evening star, in so far that he souths after the sun, but he is very badly placed for the observer throughout the month. Venus is a morning star throughout the month, but is in an indifferent position, and is becoming a very insignificant object. Mars, Jupiter, and Uranus are all three invisible. Saturn is a morning star, but he rises about 10h. 45m. P.M. on October 1, and before nine o'clock at night at the end of the month. He forms a right-angled triangle with δ and κ Geminorum ("The Stars in their Seasons," map ii.). Neptune is a morning star, but he may be fairly seen during the working hours of the amateur observer's night, as he rises before half past five in the evening at the end of October. He is about 6° south of the Pleiades in a perfectly blank part of the sky. The moon enters her first quarter at 10h. 33·6m. on the night of the 4th, and is full at 3h. 23·9m. A.M. on the 13th. She enters her last quarter at 2h. 40·8m. o'clock in the afternoon of the 20th, and is new at 7h. 15·5m. A.M. on the 27th. No less than eleven occultations of stars by the moon will be visible at convenient hours during the month. On the 6th, B. A. C. 7097, a star of the 6th magnitude will disappear at 10h. 33m. P.M. at the dark limb of the moon at an angle from her vertex of 142°. It will reappear at her bright limb at 11h. 42m. P.M. at an angle of 312° from her vertex. On the 12th, *f* Piscium, a 5½th magnitude star will disappear at her dark limb at 11h. 58m. P.M. at a vertical angle of 40°, reappearing at 12h. 15m P.M. at an angle of 19°. from the moon's vertex. On the 14th, μ Ceti, a 4th magnitude star, will be occulted as it is rising. It may afterwards be seen to reappear at 7h. 1m. P.M. at the dark limb of the moon, at an angle of 272° from her vertex. On the 16th, θ^1 and θ^2 Tauri, both stars of the 4½th magnitude, will be behind the moon when she rises. The former will reappear at 7h. 1m. P.M. at an angle of 272°, the latter at 7h. 36m. P.M. at an angle of 216° from her vertex; both, of course, at her dark limb. Later on, 80 Tauri, a 6th magnitude star, will disappear at her bright limb at 7h. 25m., at an angle of 24° from her vertex, and reappear at 8h. 4m. P.M. at her dark limb, at a vertical angle of 287°. Then at 7h. 36m., 81 Tauri, of the 5½th magnitude, will disappear at the bright limb of the moon, at an angle of 32° from her vertex. It will reappear at her dark limb at 8h. 20m. P.M., at an angle of 279° from her vertex. The last occultation on this night is that of 85 Tauri, a 6th magnitude star, which will disappear at the bright limb at 8h. 5m., at an angle of 53° from the vertex of the moon; and will reappear at her dark limb at 8h. 59m. P.M., at a vertical angle of 255°. Before the moon rises the next night (the 17th) she will have occulted 111 Tauri, of the 5½th magnitude. The star will reappearat her dark limb at 8h. 14m. P.M., at an angle of 240° from her vertex. Afterwards, at 9h. 9m. P.M., 117 Tauri, a star of the 6th magnitude, will disappear at her bright limb, at a vertical angle of 339°; reappearing at her dark limb at 9h. 17m. P.M., at an angle of 322° from her vertex. The remaining occultations occur during the morning hours. At noon, on October 1, the moon is in Libra, but at 5h. 30m. P.M. arrives on the boundary of the narrow northern strip of Scorpio ("The Seasons Pictured," plate xxvi.) By 2h. 30m. A.M., on the 2nd, she has crossed this and passed into Ophiuchus. Her path across Ophiuchus is completed by 9 P.M. on the 3rd, and she then enters Sagittarius. She quits Sagittarius for Capricornus at 9 A.M. on the 6th ("The Seasons Pictured, plate xxi.), and the last-named constellation for Aquarius 9h. 30m. A.M. on the 7th. She is travelling through Aquarius until 3h. 30m. P.M. on the 10th, and then she enters Pisces ("The Seasons Pictured," plate xxii.). She does not leave Pisces until 10 P.M. on the 13th, at which hour she passes into the north-east corner of Cetus. By 11 o'clock the next morning she has traversed this and entered Aries ("The Seasons Pictured," plate xxiii.). At 2h. 30m. P.M. on the 15th she crosses the boundary between Aries and Taurus. In her journey through Taurus she arrives at 8h. A.M. on the 18th, at the most northerly outline of Orion. It takes her twelve hours to cross this, and at 8 o'clock the same evening she emerges in Gemini ("The Seasons Pictured," plate xxiv.). Her journey through Gemini terminates at 1 P.M. on the 20th, and she then enters Cancer. At 12h. 30m. P.M. on the 21st she quits Cancer, in turn, for Leo. She passes out of Leo into Virgo at noon on the 24th ("The Seasons Pictured," plate xxv.), and from Virgo into Libra at 8h. 30m. A.M. on the 27th. Traversing the last-named constellation, she arrives, as she did at the beginning of the month at the northern apex of Scorpio ("The Seasons Pictured," plate xxvi.), at 4 A.M. on the 29th. At 1 o'clock the same afternoon she emerges in Ophiuchus. She is passing through Ophiuchus until 6 A.M. on the 31st, when she crosses the boundary into Sagittarius. There we leave her.

WHIST.

BY "FIVE OF CLUBS."

THE Whist Editor of the *Australasian*, whose skill is well known (he has read me more than one lesson by which I have profited) has obligingly sent me the following game, with the notes—except those within brackets, which are mine. I have ventured to alter his *W* and *X* into *Y* and *Z*. (I cannot understand why, using the first two letters of the alphabet for one pair of partners, he should not use the last two for the other pair, but *W*, the last but three—and an awkward letter any way—with *X*, the last but two.)

ILLUSTRATIVE WHIST HAND.

(Originally Published in the "Australasian.")

A B play against *Y* and *Z*. Score:—*A B* two; *Y Z* love.

The Hands.

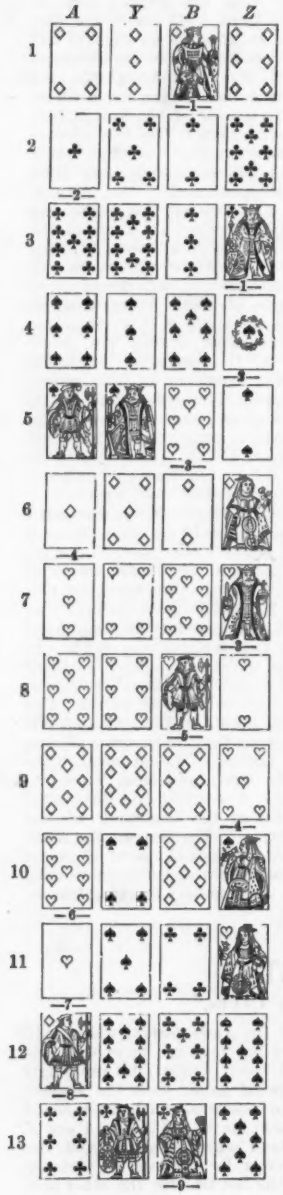
B { H. (*trumps*).—Kn, 10, 7. S.—7. C.—Q, 7, 4, 3, 2. D.—K, 9, 7, 2. }

Y { H. (*tps*).—6, 4. C.—Kn, 10, 5. D.—10, 5, 3. S.—3, 4, 5, 10, K. }

B / Y Z / *Tr.* H. Q. / A leads.

Z { H.(*tps*).—2, 5, Q, K. C.—8, K. D.—6, Q. S.—2, 8, 9, Q, A. }

A { H (*trumps*).—A, 9, 8, 3. S.—Kn, 6. C.—A, 9, 6. D.—A, Kn, 8, 4. }



and *A B* score three by cards and the game.

NOTES ON THE PLAY.

Card underlined wins trick; card underneath leading next.

Trick 2. *B* is a player who sets his face against penultimates and American leads.

Trick 3. *B* does not cover Club Ten. For the Club King is certainly not in *A*'s hand, and the probability is that it is not with *Y*. Again, the fall of the Clubs Eight, Nine, Ten shows that *Z* must either hold King sole, or else King Knave. Hence *B* has no choice but to pass *Y*'s Club Ten.

[*Z* appears also to object to the American leads, according to which (as distinguished in this case from the penultimate) he would here have led the 8.]

Trick 7. *A* having Ace and three other trumps, with Diamond strength in his own hand, and Club strength in his partner's, ventures on a trump lead. [Besides, it is clear that by leading trumps he will put *Z*, who has no Clubs or Diamonds, into a difficulty, if he wins the trick, or probably get the Ten-Ace over the Queen if *B* holds the King.] *Z* ought to have won this trick with the Queen, not with the King. Why should he have gone out of his way to make it easy for *A* to count the trumps? [May not *Z* have intended by this indication of length to warn *Y* against forcing him?]

Trick 8. *Z* is in a difficulty. He must lead either a Spade or a Heart, and of the two the Spade looks the better lead. [I must confess I differ here from the whist editor of the *Australasian*. A Spade lead would probably enable *B* to ruff, and thus force *Z*, which is what *Z* wants most to avoid. *A*'s play of the Eight is good. If *B* has any other trump it must be the Knave (thanks to *Z* for showing this); and if *B* has no other trump, the game cannot be won by any play.] Nevertheless, even the Spade lead will not save the game, as is shown by the following two possible variations of the play:—

Variation I.

	A	*Y*	*B*	*Z*
Trick 8. . .	C 6	S 4	H Kn. —5—	S Q
„ 9. . .	H 8 —6—	C Kn	C Q	H 2
„ 10. . .	H A —7—	H 6	C 4	H 5
„ 11. . .	D Kn	D 10	D 7	H Q —4—
„ 12. . .	H 9 —8—	S 5	C 7	S 8
„ 13. . .	D 8	S 10	D 9 —9—	S 9

Variation II.

Trick 8. . .	C 6	S 4	H Kn —5—	S Q
„ 9. . .	D 8	C Kn	C Q —6—	S 8
„ 10. . .	H 8 —7—	S 5	C 7*	S 9
„ 11. . .	D Kn	D 10	D 7	H 2 —4—
„ 12. . .	H 9 —8—	H 6	C 4	H 5
„ 13. . .	H A —9—	S 10	D 9	H Q

It is clear also that, if at trick 9 of the first of these variations, *Z* trump with the Heart Queen, instead of the Heart Two, he will lose all the remaining four tricks.

The whist editor of the *Australasian* also forwards me a discussion of the question whether honours can be counted, if not claimed, before the trump is turned to a completed misdeal. Such points are interesting as matters of curious discussion, though I think real lovers of whist are apt to regard the laws as of interest only for those who think more of the stakes than of the game. The paper opens thus:—

A DIFFICULT POINT OF WHIST LAW.

By the Whist Editor of the "Australasian."

I was recently asked to decide whether honours could or could not be scored after a completed misdeal. After careful consideration of the points involved, I ruled in the negative; and, at the same time, I gave the reasons on which I based my conclusion. Shortly afterwards one of the best whist-players in Melbourne intimated to me that he "dissented entirely" from my view. He wrote to me in the following terms:—"The club code is distinct. Rule 6 is that 'Honours, unless claimed before the trump card of the following deal is turned up, cannot be scored.' I contend that honours can be claimed before the completion of the deal following the misdeal—first, because a misdeal is not a deal; and secondly, because they are claimed before the trump card of the following" [valid] "deal is turned up, inasmuch as there cannot be a trump in a misdeal. I fully agree with your remarks as to the desirability of a settlement of the score before the cards are cut for the following deal. So long, however, as the present code governs the game of whist, we should not depart from a clearly worded law, whatever the original intention may have been." I am in entire accord with the views expressed in the concluding sentences of the preceding note. It is my invariable practice to base my whist rulings, if possible, on the very letter of the club code; and I never hesitate about refusing to be bound by the decisions of referees who have allowed themselves a wider latitude. But at the same time it must be borne in mind that the framers of the club code have not defined many of the technical terms which enter into the nomenclature of the game; and that they have even used some of these terms in more than one sense. Hence, it frequently happens that in deciding a whist case, the first business of the referee is to make up his mind in regard to the exact meaning, as distinguished from the popular interpretation, of one or more of the whist laws. In the case under consideration I had satisfied myself that the phrase "following deal," which occurs in Law 6,

* Would *B* go on with Clubs at the risk of forcing the trump leader unfavourably? Not knowing *Y*'s weakness in trumps, it seems to me *B* would here go on with Diamonds; in which case *Z* would make his Heart Two, and, forcing *A* with a Spade, would make another trick with his guarded Queen, and save the game.

ought to be construed as "deal of the following player," and had decided that if honours had not been "called" previous to an abortive attempt, which had deprived that "following player" of his deal, they could not be scored. On finding, however, that a competent authority had dissented from my ruling, I appealed to a friend who occupies a judicial position in New South Wales, and who is one of the best whist-players in that colony, requesting him to give me his opinion on the points at issue. I wrote to this friend as follows:—"It appears to me that the term 'claiming to score honours' is not necessarily identical in meaning with the requirement that 'at the end of a hand' players shall 'call' the honours which they allege that they have held. Strictly speaking, the latter phrase directs that, while all the facts are quite fresh in the memory of all the players, two of them shall 'audibly name' the cards on which they base their claim to score honours. In practice, no doubt, this requirement of the club code is not exactly obeyed. This, however, is a mere matter of convenience, and not, so far as I can see, because two different phrases, which are used without definition in two successive whist laws, are necessarily identical in meaning. Again, I cannot acknowledge that 'a misdeal is not a deal.' The club code expressly provides that—in the absence of certain circumstances, each one of which is explicitly specified—'a misdeal loses the deal.' Consequently, it is more than a 'not-deal,' or mere negation of a deal. In fact, according to my view, it is the 'following deal' of Law 6—abortive, it is true, inasmuch as the cards distributed to the players are not played, but nevertheless complete to this extent that, in consequence of its occurrence, the deal passes to the player on the left of the one whose proper turn it is to deal. It is because of this effect of a misdeal that I feel certain in regard to its barring the scoring of honours, which the law requires to be called at the end of any hand, in respect to which the claim to score them may arrive. But inasmuch as a whist-player, who stands in the first rank, has protested against my decision, I shall feel obliged by your examining the case, and by your obliging me with your opinion in reference to the points at issue." I may add that I had said in my published ruling that "it is a matter of custom and convenience to regard the phrase 'end of the hand' as being synonymous with the interval which is occupied in dealing, and during which play is suspended. Hence, there can be no doubt that in the event of W's attempting to deal with an important pack, and subsequently insisting on his right to a new deal, A and B's claim to score honours would not be disputed, provided the claim were made antecedent to the completion of W's new deal. Such new deal, however, is the 'following deal,'—that is to say, 'the deal of the following player'—of the club code; but, manifestly, this is not the case in regard to the deal which passes from A to B, in consequence of W's having misdealt." I had also said that my remarks might be regarded as implying that "when a player deals out of his turn, the right of scoring honours should lapse, in case of their not having been called immediately after the conclusion of the preceding hand. But it is obvious that this objection admits of the reply that at any time antecedent to the completion of such deal in error, the proper dealer can insist on dealing. Hence this mistake is altogether different in character from a misdeal, which deprives the 'proper dealer' of the right to deal." Then, in conclusion, I had expressed the hope that "among the amendments to be made hereafter in whist law will be the enactment of an explicit rule that all questions of score shall be settled before the cards are cut for the following deal."

For the rest of the paper we have not at present space. The reply of the New South Wales player is rather voluminous, and leads to a still more voluminous rejoinder. The whole matter seems to me included in the consideration that the object of the law is clearly to insist that honours must be claimed between the close of the play to the hand whereunto they belong, and the beginning of the play of the next hand. As this play does not commence after a misdeal, completed or otherwise, the contention of the whist editor of the *Australasian* appears to me to be unsound. The law is not a pleasant one, any how. The practice should be to attend to the score, and settle all about it before cutting for a fresh deal. And were it not for the weary waste of words so often following the play of a hand this would always be easily managed.

MATHEWS ON WHIST.

We propose to begin in our next a series of papers on the fine strategic whist of Mathews, re-arranging his maxims (which they much need), explaining matters where his writing is obscure, and pointing out where modern whist departs from the whist of Mathews' days (apart from those merely conventional arrangements which many fondly imagine to constitute the science of whist as now played).

Our Chess Column.

By "Mephisto."

ENGLISH PROBLEM COMPOSERS.

II.—A. E. Studd.

WE have much pleasure in continuing our series of articles on English problemists by reproducing the masterly compositions of Mr. A. E. Studd. It will be seen from the specimens published below that the composer is versatile in all branches of problem composition. He has the clever gift of making difficult problems by using the pieces freely, but his problems never seem overburdened, and mostly represent masterly conceptions, in which all the parts harmonise with the whole idea in a pleasing manner. This is exemplified, amongst others, by problem No. 1, where, in spite of Queens, Rooks, and other pieces, the Black King is given the utmost freedom of action, and the final mate occurs in the purest possible manner, one move with the Knight cutting off no less than four squares of the Black King.

In order to appreciate the fine points in these problems we strongly recommend our readers to make a fair attempt to solve each particular problem before looking at the solution.

No. 1 Position.

White—K on Q2. Q on K Kt2. R on QBsq. Kt's on KB3, QB4. B's on QKt3, Q6. P's on K Kt5, KB6. (Nine pieces.)
Black—K on Q4. Q on KBsq. R on Q2. Kt on KR4. P's on K Kt3, QB2, QKt3, 5. (Eight pieces.)
Mate in two moves.

No. 2 Position.

White—K on QR2. Q on K Kt7. R's on KB6, QB4. Kt's on QB2, 6. B's on QR5, K8. P's on K2, 5, QR4. (Eleven pieces.)
Black—K on Q4. R on Q2. Kt on QB4. B on K3. P on KB5. (Five pieces.)
Mate in two moves.

No. 3 Position.

White—K on QB6. Q on QKt5. R's on KR sq, K7. Kt's on KKt4, K5. B on QR sq. P's on KR5, KB2, 6, 7. (Eleven pieces.)
Black—K on KKt4. P on KR2. (Two pieces.)
Mate in two moves.

No. 4 Position.

White—K on QKt sq. Q on KR8. R's on Q sq, QB3. Kt's on KKt3, K3. B on QB7. P's on KKt2, KB6, K6, QKt5, QR2, 3. (Thirteen pieces.)
Black—K on Q5. Kt on Q6. B on Q7. P's on QKt2, 3. (Five pieces.)
Mate in two moves.

No. 5 Position.

White—K on KR4. Q on KB2. R on KKt5. Kt's on QKt2, 5. B's on K5, QKt7. P on QB6. (Eight pieces.)
Black—K on Q4. R's on K6, QR sq. Kt's on KR3, K3. B on QKt5. P's on K5, Q6, QB2, KR6. (Ten pieces.)
Mate in three moves.

No. 6 Position.

White—K on KR sq. Kt on Q sq. P on QR2. P on KB3. B on KKt4. Kt on K4. B on Q6. Q on QB6. R on KB8. (Nine pieces.)
Black—B on QKt sq. R on QR2. P on K3. P on KKt4. B on KB4. Kt on K4. P on QKt4. P on KR5. K on KB5. Kt on QB5. P on QKt6. P on KR7. (Twelve pieces.)
Mate in three moves.

No. 7 Position.

White—B on KB sq. R on QR sq. K on Q2. P's on KB3, QB3, KR4, KB5. Kt on KR6. B on QKt6. Kt on QB8. (Ten pieces.)
Black—K on Q4. P on QB5. (Two pieces.)
Mate in three moves.

No. 8 Position.

White—P's on QB2, KB3. K on KKt4. R on QR4. B on K5. P on KB6. Kt's on Q7, QR7. (Eight pieces.)
Black—B on KB sq. P on K3. K on Q4. P's on QB4, QKt5. (Five pieces.)
Mate in three moves.

No. 9 Position.

White—B on KKt sq. R on Q sq. K on QR sq. P on KB2. P on QKt2. Kt on QB3. R on KKt4. P on QKt5. Kt on QB6. P on KB7. Q on KR7. (Eleven pieces.)
Black—P's on KKt4, QB4. K on QB5. Kt on Q5. P's on QKt6, QR7, KKt7, Q7. (Eight pieces.)
Mate in three moves.

No. 10 Position.

White—K on KKt sq. P on KB2. Kt on QB2. P on KKt3. R on K3. P on Q4. Kt on KKt5. R on QB5. P on KB6. B on K6. P on KB7. (Eleven pieces.)

Black Q on KB sq. B on QB2. Kt on KR3. K on Q3. R on QKt3. P on QKt4, P on K5. P on QB6. Kt on QR7. (Nine pieces.) Mate in three moves.

No. 11 Position.

White—R on Q sq. K on QKt sq. P on KKt3. Kt on K4. P on QR4. B on QKt5. P on QR6. P on KKt7. Q on KB7. B on QB7.

Black—Kt on KKt sq. B on QR sq. Q on KR2. P on KB3. Kt on K3. P on KB4. K on Q4. P on QB4. B on Q5. P on QKt5. (Ten pieces.) Mate in four moves.

No. 12 Position.

White—K on K sq. Kt on KKt2. P on K3. B on QB4. P on KR5. R's on QB5, QB8. (Seven pieces.)

Black—B on KKt2. P's on KKt6, QKt6, QKt7. Kt on QR8. R on QKt8. K on QB8. B on KB8. (Eight pieces.)

White to play and compel Black to mate him in four moves.

SOLUTIONS.

No. 1.—1. B to K5. 1. Any. 2. Mates accordingly.
No. 2.—1. Q to Kt4 „ „ „
No. 3.—1. Kt to R2 „ „ „
No. 4.—1. Q to QKt8 „ „ „

No. 5.—1. R to B5 / R to B6 — or 1. any / Kt × R (ch) — or 1. B to K8
2. Q to B5 (ch) / KKt or B × Q — 2. Q × Kt / any — 2. B to Kt3 (dis. ch) / Kt × R (ch)
3. Mates accord. — 3. B disc. (ch) mate. — 3. Q × Kt mate.

No. 6.—1. Q to B7 / B × Q — or 1. any / R × Q — or 1. any / P to R6 &c.
2. Kt to B6 / any — 2. Kt (K4) to B3 / any — 2. B × Kt (ch) / Kt × B
3. Kt mates — 3. Kt mates — 3. Q mates

No. 7.—1. R to R8 / K to K4 — If 1. any / K to B3
2. B to Kt2 / any — 2. B × P / K moves
3. Mates accordingly. — 3. Mates accordingly.

No. 8.—1. K to Kt5 / B to Q3 — or 1. any / B elsewhere — or 1. any / P to B5
2. Kt to Kt6 (ch) / K × B — 2. K or P × B / any — 2. R to R5 (ch) / B to B4
3. Kt to B6 / mate — 3. R, Kt or P / mates — 3. R × B / mate

No. 9.—1. Q to Kt sq / P × Q — 2. K × P / K to Q6 — 3. Kt to Kt5 / mate

No. 10.—1. P to Q5 / K to K4 — or 1. any / K × R — or 1. any other
2. Kt × P / R × B — 2. any other — 2. Kt × P (ch) / K to B5 — 2. Kt × P(ch) / K to K4
3. P to Q6 / mate — 3. P to B4 / mate — 3. P to Q6 / mate — 3. P to B4 / mate

No. 11.—1. B to KB4 / Q × P — or 1. any / K × Kt
2. Q × K Kt / B to Kt2 — If 2. any / B to B3 — If 2. any / Q to B sq — 2. Q × Kt(ch) / B to K4
3. Q to R7 / any — 3. B × B (ch) / any — 3. Kt × P(ch) / Q × Kt — 3. Q to QB6(ch) / B × Q
4. Q or Kt / mates — 4. Q × Kt / mate — 4. Q × B / mate — 4. B × B / mate

No. 12. A most difficult sui-mate. It was published in "La Stratégie" some years ago, and beat nearly all the regular corps of solvers.

1. B to Q5 (disc. ch) ! B to B5 if 1. B to B6 (ch)
2. R(B5) to B6 B to K4 (best) 2. R × B (ch) Kt to B7(ch)
3. P to R6 B moves 3. R × Kt (ch) P × R
4. R or P × B Kt mates 4. R × P (ch) K × R mate

N.B.—The only reason for playing 1. B to Q5 is to provide for Black in the first variation playing 3. B to Q 3; when if 4. R × B Black replies 4. K to B7 (ch), and unless the white B stands at Q5 the white R could interpose.

The Chess Problem Text-book, with Illustrations.—Under this title a notable addition to the literature of the Chess problem art is in course of preparation, and will be issued as soon as possible. It will be the joint work of Messrs. H. J. C. Andrews, E. N. Frankenstein, B. G. Laws, and C. Planck, M.A., and, besides including a selection of 400 problems and positions by those well-known composers, will contain an illustrated essay on the art. The latter will be a novel and special feature in the book, no treatise or dissertation by any recognised authority having hitherto been published in this country. The volume will be brought out by the eminent firm of Cassell & Co., Limited, and the publishing price will be 6*s*.

A MALEVOLENT CRITIC.

The *Saturday Review* has not thought it disgraceful to once more justify its title to be called the "Saturday Reviler." This time it is to scoff at an aged painter of the highest repute—Mr. Herbert—upon his retirement to the rank of "Honorary Academician," after a career such as few, if any, painters living can boast. This it pleases "the Reviler" to congratulate artists upon as "good news," without a word or a thought of what the retiring Academician has done in art, except to utter the contemptible untruth that "his resignation means that he has found out that he is beaten," *not* by the natural failing of old age, but because he failed to impress such a writer as this with the special exhibition of the works of his long life, that was made some few years back to mark the completion of his last great picture for the House of Lords, "The Judgment of Daniel." That exhibition, which most people who know anything about painting in its highest style of religious and monumental art, thought a most interesting display of a painter's career, is described by this most genial of critics as "acres of pallid purple canvases, with wizened saints and virgins in attitudinising groups." But, as Goethe says, "The eye sees what it came to see." The "Saturday's" art critic, if he ever saw this exhibition at all, went to see the "acres of purple canvases, with their wizened saints" which were not there. No matter—it suits his purpose to declare that they were, just as it does to cram into a paragraph more ignorance, insolence, and false assertions combined than is often to be met with even in this locality of literature, where the editor seems to be surrounded with all the prigs, and the pumps, and the snobs of the literary profession. But the art prig had his little game in thus flinging dirt at a venerable painter retiring upon his laurels, and, while he did this with his one hand, he points with his cleaner paw to *his* favourite painters that *he* would recommend for election to the Academic Forty, though such is his habit that he cannot even do this without scattering some slander upon artists he writes down as asses. The force of *Saturday Review* assurance could hardly further go, but done in this dirty way, wrapped up in abuse of an eminent man, it becomes abominable and utterly unworthy of the public press.—*Truth*.

Contents of No. 11.

	PAGE
The Unknowable. By Richard A. Proctor	321
Mr. Froude on Greater Britain	322
Etna's Eruptions	324
The Story of Creation: a Plain Account of Evolution. By Edward Clodd	327
Coal. By W. Mattieu Williams	329
Optical Recreations. By a Fellow of the Royal Astronomical Society	331
Americanisms. By Richard A. Proctor	332
Indian Myths. By "Stella Occidens"	333
The Star-clouds in the Pleiades. By Richard A. Proctor	334
Three Puzzles	336
The Naturalist's Laboratory	337
Gossip. By Richard A. Proctor	339
Reviews	341
Our Chess Column. By "Mephisto"	342
Our Whist Column. By "Five of Clubs"	343
The Face of the Sky for September. By F.R.A.S.	344

TERMS OF SUBSCRIPTION.

"Knowledge" as a Monthly Magazine cannot be registered as a Newspaper for transmission abroad. The Terms of Subscription per annum are therefore altered as follows to the Countries named:

	s.	d.
To West Indies and South America	9	0
To the East Indies, China, &c.	10	6
To South Africa	12	0
To Australia, New Zealand, &c.	14	0

To any address in the United Kingdom, the Continent, Canada, United States and Egypt, the Subscription is 7s. 6d., as heretofore.

XUM